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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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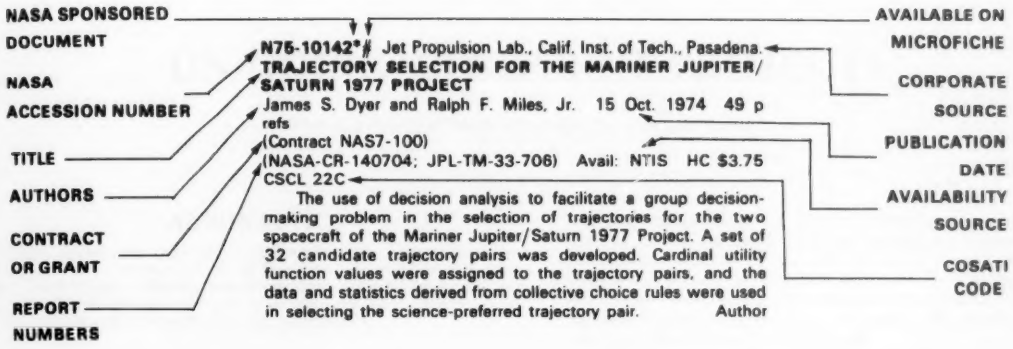
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COSATI CODE
N75-10142* # Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
TRAJECTORY SELECTION FOR THE MARINER JUPITER/ SATURN 1977 PROJECT
James S. Dyer and Ralph F. Miles, Jr. 15 Oct. 1974 49 p refs
(Contract NAS7-100)
(NASA-CR-140704; JPL-TM-33-706) Avail: NTIS HC $3.75
CSCL 22C
The use of decision analysis to facilitate a group decision-making problem in the selection of trajectories for the two spacecraft of the Mariner Jupiter/Saturn 1977 Project. A set of 32 candidate trajectory pairs was developed. Cardinal utility function values were assigned to the trajectory pairs, and the data and statistics derived from collective choice rules were used in selecting the science-preferred trajectory pair. Author

ON-GOING RESEARCH PROJECTS

This is a listing of research projects - not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research And Support Facilities (air). For Related Information See Also Astronautics.

1.0001, COUPLED HELICOPTER APPROACHES
C. GRIFFITH, Sperry Rand Corporation, *Phoenix, Arizona* 85002 (DAAB07-72-C-0315)

Determine adequacy of MLS for steep coupled approaches in a helicopter. Examine the role and suitability of an automatic flight control system in steep helicopter approaches and landings.

Fabricate a state-of-the-art approach coupler which will be part of the development of an automatic helicopter approach system (AHAS), to be installed in and integrated with a helicopter, type NUH-1B, S/N 64- 18261. The AHAS will accept inputs from the a-scan approach and landing system and provide command signals to the automatic flight control system (AFCS) of the helicopter.

Supporting agency address information: ECOM Avionics Lab AMSEL-VL- D, Ft. Monmouth, N.J. 07703

SUPPORTED BY U.S. Dept. of Defense - Army

1.0002, EMERGENCY POWER SUPPLY
R. SPIES, Rockwell International Corp., *Canoga Park, California* 91304 (F33615-74-C-2020)

The objective of this program is to define advanced technology aircraft emergency power systems (EPS) which will be capable of meeting the requirements of 1975-1980 aircraft and post 1980 aircraft. These systems shall be capable of providing long duration low power output for flight control functions and short duration high power output for main engine start attempts or other high power requirements. It shall be a primary goal to accomplish this with substantial weight and volume savings over systems currently available. It shall also be a goal of this program to provide designs which offer maximum technology flexibility for future aircraft and which are attractive from a cost of ownership standpoint. This program is not directed toward any specific aircraft but rather toward the types of future aircraft which will employ either a single or twin turbofan engines.

This program will be an 8 month effort to perform studies and analyses leading to definition of two optimum aircraft emergency power systems. Both near term and far term aircraft requirements are to be considered. The final product of this program shall be a technical report detailing candidate EPS designs and the assoicated R and D tasks necessary to develop and demonstrate the selected design. Active participation of an airframe contractor as either the prime or subcontractor is considered mandatory in the performance of this study.

Supporting agency address information: AF Aero-Propulsion Laboratory POP, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0003, COMPATABILITY OF COLLISION AVOIDANCE SYSTEM (CAS)
D.D. CROMBIE, U.S. Dept. of Commerce, Off. of Telecommunications Sc., *Boulder, Colorado* 80302 (045419 (TRAIS NO.))

This agreement is for tests to determine the mutual interference effects of three Collision Avoidance Systems (CAS) (Separation control of aircraft by nonsychronus Techniques (SECANT) Time/Frequency and Avoid) both to and from, Radio Altimeters, TematRon II (Candidate for the Defense Naviagation Satellite System) Narrow Band Frequency Modulation (NBFM) and Delta Modualtion (DM) Systems.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

1.0004, FLYING QUALITIES REQUIREMENTS VALIDATION USING THE C-5A
C. SILVERS, Lockheed Georgia Company, *Marietta, Georgia* 30060 (F33615-75-C-3012)

In order to build confidence in present requirements or define areas for improving them, it is necessary to evaluate the present criteria using real airplane data. The objective of this effort is to evaluate present flying qualities requirements for large airplanes using flight test data for the C-5A airplane. Where deficiencies are identified, new criteria will be recommended.

Quantitative flight test data will be analyzed to determine the dynamic characteristics of the C-5A airplane. These will be compared with the present requirements of MIL-F-8785B 'Flying Qualities of Piloted Airplanes'. Compliance or non-compliance will be validated by correlating the quantitative results with qualitative pilot opinion evaluations. Where discrepancies are identified, adjustments to existing requirements will be suggested or, if present requirements appear totally inadequate, new requirements or new approaches to requirements will be suggested.

Supporting agency address information: AF Flight Dynamics Laboratory FGC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0005, AERODYNAMIC FORCE GENERATING SYSTEM
UNKNOWN, Beech Aircraft Corporation, *Wichita, Kansas* 67206 (N0019-74-C-0449)

To improve the state-of-the-art of aerial refueling capability under adverse weather conditions and to obtain greater assurance of successful engagement.

The system will provide aerodynamic and mechanical power to align the drogue of the tanker aircraft with the probe of the receiver aircraft when provided an alignment error correction signal.

Supporting agency address information: Naval Air Systems Command 530313C, Washington, D.C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0006, QUICK RESPONSE EFFORT IN AREAS OF AVIATION WEATHER MEASUREMENT
UNKNOWN, U.S. Dept. of Commerce, National Weather Service, *Silver Spring, Maryland* 20910 (045450 (TRAIS NO.))

The contractor shall provide the necessary personnel, services and facilities to provide a quick response to problems in the areas of aviation weather measurements.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

1.0007, DEVELOPMENT OF MATHEMATICAL MODEL OF AIRCRAFT VORTEX WAKES
UNKNOWN, Aeronautical Res. Associates, *Princeton, New Jersey* 08540 (048934 (TRAIS NO.))

The objective of this program is to develop a mathematical model of an aircraft vortex wake immediately after it is shed from an aircraft wing. This mathematical model could then be used as the starting point for calculations of the subsequent aging of vortex wakes. The aircraft chosen for this effort are the following: the Boeing 727, the Boeing 747, the McDonnell-Douglas DC-10 and the Lockheed L-1011.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

1.0008, INVESTIGATION OF AIRPORT RUNWAY ROUGHNESS
L.M. WOMACK, U.S. Air Force, Weapons Laboratory, *Albuquerque, New Mexico* 87117 (045423 (TRAIS NO.))

This agreement is to establish certification criteria for general aviation aircraft in the determination of the functional failure of a runway and isolation of areas causing excessive dynamic response of the airplane. The end result will provide a technique(s) and method(s) of rapidly evaluating pavements of roughness and relating this information to the performance of any air carrier type aircraft. In addition it will be determined at what 'quantity' roughness becomes a constraint in pavement design along with presently accepted design parameters.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

1.0009, DEVELOPMENT OF A DEAD-MAN'S BUTTON
C.W. SEMJACOBSEN, E E G Research Center, *Oslo, Norway* (045342 (TRAIS NO.))

The contractor is to conduct functional operational and reliability testing of a computerized on-board electrocardiographic warning system to prevent aircraft accidents in case of sudden incapacitation of the pilot or co-pilot.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

1.0010, AIRCRAFT PROPULSION LUBRICATING FLUID ADDITIVES- BOUNDARY LUBRICANTS SURFACE FILM
C.M. ALLEN, Battelle Memorial Institute, *Columbus, Ohio* 43201 (F33615-73-C-2026)

The objective of this research effort is to investigate and develop an understanding of the physical and chemical mechanisms of film formation. Areas of investigation include long range ordering, synergistic effects and mechanical properties of films.

Long range ordering, synergistic effects of solvents and additives, lubricant mechanical properties and the correlation existing between these three areas shall be investigated through use of microcalorimetric measurements, internal reflection spectroscopy, high resolution nuclear magnetic resonance.

Supporting agency address information: AF Aero-Propulsion Laboratory SFL, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0011, DISSIMILAR REDUNDANCY
R.J. HOVDE, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433

Presently, both the military and civilian flying community, involved in low visibility operations, incur a large expense in providing necessary redundancy of various components of the flight control system. The objective is to determine if the function of the failed component can be obtained as a secondary output of another functional but dissimilar component, thereby eliminating some of the similar redundancy.

The approach is to investigate the various components of the flight control system, both analytically and in the lab, to see what secondary functions can be obtained. Final verification will be by flight test on the AWLS NC-141A, NO. 61-2775.

Supporting agency address information: AF Flight Dynamics Laboratory FGS, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0012, CAT III OPERATIONS PROCEDURES
R.J. HOVDE, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433

Operational procedures for aircrew and air traffic control during category III operations are essentially non-existent. The objective is to develop operational aircrew and air traffic control (ATC) procedures which will allow routine category III weather operations.

Based upon baseline performance and failure analyses, aircrew and ATC procedures will be established to insure flight safety. These procedures will be used to fly actual weather approaches, during which aircraft separation criteria, ground control procedures and refinements to the aircrew and ATC procedures will be developed. After sufficient experience in the low visibility environment is gained, different aircrew procedures will be investigated, varying the workload and the displays to be monitored.

Supporting agency address information: AF Flight Dynamics Laboratory FGS, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0013, AREA NAV TRANSITION TO ILS/MLS
R.J. HOVDE, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433

With the impending imposition of area navigation upon the civil and military fleet, no definition has been given to the control techniques and tracking accuracy requirements for transitioning to the ILS or MLS. The objective is to establish technical requirements for aircraft transition from the area navigation enroute flight structure to the final approach fix of ILS and/or MLS.

A study will be made of the traffic flow from the area NAV enroute flight structure to the terminal area final approach fix. A set of approach route requirements will be developed to define the various possible transition maneuvers. The transition maneuvers will then be studied to determine what restrictions may be required due to the performance characteristics of various aircraft.

Supporting agency address information: AF Flight Dynamics Laboratory FGS, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0014, AUTO/MANUAL TAKEOFF/LANDING
T. JOHANI, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433

At present, a capability of performing routine landings and takeoffs during category III meteorological conditions does not exist for either the Air Force or commercial airlines. The objective is to develop concepts, techniques and equipment requirements for low visibility operations in both the manual and automatic mode.

The approach is to use a suitably modified and instrumented C-141 aircraft to verify by flight test the requirements necessary for category III operations.

Supporting agency address information: AF Flight Dynamics Laboratory FGS, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0015, ADVANCED REMOTELY PILOTED MODULAR AIRCRAFT (ARPMA) STUDIES
T.L. LARSEN, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433

Advanced operational multi-mission remotely piloted vehicles (RPVS) must have the capability to perform several different missions, employing vastly different special mission equipment. This requirement necessitaties an airframe of modular design to accomodate rapid interchange of aerodynamic surfaces, launch and recovery equipment, and primary mission equipment modules. The objective of this program is to perform conceptual

design studies leading to the design of an advanced modular technology demonstrator RPV.

Special emphasis will be placed on the application of the principle of modularity to both the total airframe, and to each subsystem. This will promote interchangeability of major structural components as well as subsystems components. Two parallel contracted efforts will be employed to support the in-house study in FY 75.

Supporting agency address information: AF Flight Dynamics Laboratory PTR, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0016, INS SMOOTHING

M.J. WILSON, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433

During an ILS approach with present equipment, the pilot has no way of determining when beam drift or bends have occurred. This system will augment the ILS beam with on-board inertial sensors. An additional benefit is that low quality ILS beams could be used with lower weather minima than presently authorized.

The modification to the present inertial system on board the AWLS C-141 is to be done by a contractor. Air Force will evaluate the benefits of the modification through flying approaches against various ILS beam in simulated and actual low visibility weather.

Supporting agency address information: AF Flight Dynamics Laboratory FGS, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0017, YAW AUGMENTATION SYSTEM FLIGHT TEST EVALUATION

W.L. YOUNG, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433

A series-parallel yaw system has been designed and built under Work Unit 82260115 to relieve the pilot in a high-workload axis. The yaw system has such features as heading hold and automatic turn coordination. A CH-3E helicopter will be used as the research vehicle for this evaluation. The system will be tested and evaluated by human factors engineers during this task. Approach parameters such as capture range and letdown angles will be varied during this evaluation to simulate extreme conditions incurred by the pilot during IFR mission profiles.

A CH-3 helicopter will be used as the research vehicle in this evaluation. The experimental equipment will be evaluated in the approach and landing phase of the V/STOL flight profile with the emphasis on close-in beam captures and high-angle letdowns. The evaluation will consist of subjective and objective data and will be evaluated according to pilot acceptance and the increase in performance of the man-machine system in simulated IFR conditions.

Supporting agency address information: AF Flight Dynamics Laboratory FGF, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0018, HELICOPTER PERFORMANCE SIMULATION 12096-RTL

B.W. MCCORMICK, Penn. State University, School of Engineering, *University Park, Pennsylvania* 16802 (DAHC04-74-G-0051)

To evaluate a helicopter performance simulation program. The simulation model being evaluated is used by several army agencies in the analysis and prediction of the aeroelastic behavior of rotors. It is one of the principle programs used by AVSCOM to evaluate new rotary wing designs.

The program uses a generalized model approach to predict the aeroelastic behavior of a rotor. In addition to predicting blade motion and stresses, the program includes trim and control angles, performance items and stability derivatives. Each aspect of the program will be examined and corrected for any errors which might be found. In addition, the Eustis Programs in aeromechanics will be evaluated in relation to programs in this area at other directorates.

Supporting agency address information: OCRD Army Research Office Box CM Duke Station, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

1.0019, TEST THE MINNEAPOLIS-HONEYWELL COLLISION AVOIDANCE SYSTEM

UNKNOWN, U.S. Navy, Air Development Center, *Warminster, Pennsylvania* 18974 (045429 (TRAIS NO.))

This agreement is to extend investigations of the collision avoidance system (CAS) developed by Minneapolis-Honeywell. The objective of these undertakings is to establish the relative capabilities of the Minneapolis - Honeywell CAS with respect to other known systems and to determine the limits of the capabilities of the technique for assessment of its potential for handling traffic of the 1980/1990 time period.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, MATERIAL SUPPORT TECHNOLOGY - PHOTOACTIVATION AND DISSOCIATION KINETICS

E.K. LEE, Univ. of California, School of Physical Sciences, *Irvine, California* 92664 (N00014-69-A-0200-9005)

The Navy has need for increased knowledge of chemical kinetics under the category of material support technology. The possibilities which exist include new technology for chemical synthesis, modification of radiation characteristics of rocket plumes, modification of characteristics of explosives, and new materials for chemical lasers.

This work examines the kinetics of energized molecules produced by photoactivation. Particular questions of interest include the effects of vibronic symmetry, rotational energy, time scale of vibrational energy redistribution, and electronic orbital symmetry on the reaction pathways.

Supporting agency address information: Office of Naval Research 421, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0002, HTPB BONDING STUDIES (IED)

B. WASSERMAN, U.S. Navy, Propulsion Development Dept., *Ridgecrest, California* 93555

The objective of this task is to develop a means of bonding HTPB propellant to Dow-Corning 93-104 silicone rubber or its equivalent. This rubber is the baseline combustor insulation for the ALRAAM and MPM integral rocket/ramjet motors and is also considered to be a candidate insulator for present and future smokeless motors. The bonding method must be cost effective for use in motor production. The bonding technique must not introduce a significant amount of combustible matter.

The approach involves the elucidation of how different HTPB propellant formulations and different silicone resin formulations effect bond strength. Techniques will be used to alter the wettability and to provide bonding sites on the silicone surface or by chemically treating the cured rubber. Methods will be devised for bonding a barrier to curative migration between TH 93-104 and the propellant.

Supporting agency address information: Naval Weapons Center (NWC-01), China Lake, California 93555

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0003, ELECTRON MICROSCOPY OF CERAMIC MATERIALS FOR HIGH TEMPERATURE STRUCTURAL COMPONENTS

N.J. TIGHE, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Washington, District of Columbia* 20234

The silicon nitride and silicon carbide ceramic materials being considered for use in turbine engines were examined by light and electron microscopy to analyze the microstructural changes that occurred during heating in oxidizing and reducing atmospheres. It is proposed to investigate more completely the

oxide reaction product layer formed at 1400 degrees C after long time anneals and after slow crack propagation experiments. The results will be used to develop models for oxidation and for the effects of oxidation on fracture toughness.

Objective: The objective of the project is to determine how deformation and failure of ceramic materials used in high temperature structural application are related to microstructural changes such as recrystallization, precipitation, phase transformations and pore growth produced during exposure to service environments. Typical materials of interest are silicon nitride, silicon carbide and selected mixtures of these compositions which are used in gas turbine engines.

Motivation: Sintered and hot-pressed ceramic compacts usually have heterogeneous structures which do not match the ideal microstructures assumed in equations evaluating materials' strength. These ceramic microstructures can be analyzed by correlating results of light and electron microscopy. Systematic acquisition of microstructural information is essential to continued progress in evaluating structure sensitive properties. For example, the optimum microstructures required for high strength ceramics are not known. Such microstructural information is availabde for most metals and metal alloys as a result of intensive electron microscopical programs. However, specimen preparation techniques for ceramics were developed after those for metals and only a few ceramic materials have been selected for study. Researchers who investigate mechanical properties are aware of the information gap but usually are unable to acquire the information themselves.

Ceramic materials are being manufactured as components in turbine engines with the expectation that stationary and mobile engines can operate at higher temperatures than superalloys with greater efficiency and less atmospheric pollution. The ceramic component turbine engines will operate with either fuel oil or with gasified coal and the initial engine developments are directed toward cycle plants. Ceramic materials microstructural analysis has received little attention to date because of the complex microstructures. (Text Abridged)

SUPPORTED BY U.S. Dept. of Commerce - N.B.S.

3.0004, WEAPONRY - CATALYTIC BEHAVIOR IN COMPOSITE SOLID PROPELLANT

W.C. STRAHLE, Georgia Inst. of Technology, School of Aerospace Engin., *Atlanta, Georgia* 30332 (N00014-67-A-0159-0016)

The objective of this work is to obtain quantitative understanding of the combustion of ammonium perchlorate--binder--ammonium perchlorate (AP) sandwich models in an effort to establish a predictive capability for the burn rate behavior of composite propellants. The research, hopefully, will contribute fundamental kinetic data on binder and oxidizer decomposition; and gas-phase, catalytic, and interface reactions--all pertinent to cost reduction aspects of propellant formulation and development for Navy missiles.

The investigation is aimed at acquisition of experimental data relevant to combustion of AP-binder sandwiches incorporating catalysts within the binder, oxidizer, or at the interface and extension of an analytical model to include several effects of importance. A combustion bomb, with burning up to 3200 PSI, will be utilized with deflagration characteristics inferred through cinephotomacrography and quenched sample photomicrography.

Supporting agency address information: Office of Naval Research 473, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0005, RECLAMATION OF PROPELLANTS

D.M. FRENCH, U.S. Navy, Propellant Science Department, *Silver Spring, Maryland* 20910

With reference to possible use as decomposable binders to study the thermal and hydrolytic stability of polymeric materials with and without various additives, and to examine existing explosive and propellant binder materials with regard to thermal and hydrolytic stability and produce practical decomposable systems.

The thermal stability of polymers will be determined alone and in the presence of additives. Degradation of explosives and propellants will be attempted by oxidative scission and by hydrolytic mechanisms.

Supporting agency address information: Naval Ordnance Systems Command ORD-0332, Washington 25, D.C. 20376

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0006, NOISE ABATEMENT AND INTERNAL VIBRATION ABSORPTION IN POTENTIAL STRUCTURAL MATERIALS

S.A. KULIN, Manlabs Incorporated, *Cambridge, Massachusetts* 02138 (DAAG46-74-C-0048)

To explore the physical basis on which structural materials with high damping capacity can effectively convert acoustic energy (10 hertz- 10,000 hertz) to heat.

To establish the mechanism of accoustical damping in selected materials, which preliminary evidence has indicated as prime candidates materials through a) structural studies by x-ray diffraction and electron microscopy, b) thermodynamic studies by differential thermal analysis and c) physical parameter studies by vibrational damping as well as yield and strength measurements.

Supporting agency address information: Army Materials and Mechanics Res. Center AMXMR-D, Watertown, Ms. 02172

SUPPORTED BY U.S. Dept. of Defense - Army

3.0007, GAS PHASE BORON COMBUSTION CHEMISTRY

W. MILLER, Aerochem Research Labs. Inc., *Princeton, New Jersey* 08540 (N00014-74-C-0326)

The objective is to quantitatively determine the energy available from the combustion of boron fuels. Although the thermochemistry of boron combustion suggests high heat release rates, the kinetics of the gas phase reactions and rate of condensation of B203 may make at least a fraction of stored energy unavailable for practical use in Naval vehicles.

The interconvertibility of the oxide and oxyhydroxides of boron and the rate of condensation of B203 will be studies in H2/O2/N2 plans seeded with boron. Mass spectrometry will be used to monitor gas phase composition. Laser light scattering techniques will be used to detect the onset of condensation.

Supporting agency address information: Office of Naval Research 473, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0008, FATIGUE CRACK NUCLEATION AND PROPAGATION IN ALPHA-BETA TITANIUM ALLOYS

H. MARGOLIN, Polytechnic Inst. of New York, Graduate School, *Brooklyn, New York* 11201 (AF-AFOSR-2774-75)

The longevity, reliability and safety of aerospace structures are related to the fatigue properties of the structural materials used. In fact, the fatigue properties of structural materials often limit their application. Thus, it is important to understand the mechanisms of fatigue and especially the metallurgical means by which fatigue resistance may be improved. Systematic studies of fatigue crack initiation and propagation in alpha-beta titanium alloys are of great interest to the Air Force, and would make a useful contribution to future development of engineering alloys. The objective of this research is to determine the relationship between fatigue properties and microstructure of two-phase (alpha-beta) titanium alloys. Specifically, the Ti-Mn system will be used as a model system for alloys consisting of two ductile phases. Alloy composition and heat treatment can be used to vary the volume fraction and morphology of the phases present, and thus, by this study, the most desired microstructures for fatigue resistance can be determined. Fatigue crack initiation and propagation characteristics will be related to microstructural features such as phases present, particle size and distribution, and dislocation densities. Monotonic and cyclic stress-strain curves will be determined for each alloy composition to aid in interpretation of fatigue data.

Supporting agency address information: AF Office of Scientific Research NE, 1400 Wilson Blvd, Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0009, TURBINE SHROUD ABRADABLE MATERIALS EVALUATION
A.L. BUTCHER, Union Carbide Corporation, *Cleveland, Ohio* 44130 (F33615174-C-2026)

The turbine section of a gas turbine engine is being designed for high temperature environments. Emphasis has been placed on cooling technology, stress design, structural materials technology and blade aerodynamics, but relatively little emphasis has been placed on turbine shroud problems other than cooling techniques. One area which has been severly neglected and is sorely needed is the abradable materials technology for high temperature environments. At present there are no adequate abradable materials which will allow close clearance turbine operation and subsequent higher performance engines.

This program will involve the development and rig testing of abradable materials for use in the first stage of current and future turbines. Emphasis will be placed on abradability, oxidation resistance, thermal stability, erosion resistance and cooling effectiveness. The material will be exposed to temperatures exceeding 2700 degrees F but should be maintained at 17 - 1800 degrees F with cooling air.

Supporting agency address information: AF Aero-Propulsion Laboratory TBC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0010, LUBRICANT/GEAR LOAD CAPACITY MEASUREMENT
L.J. DEBROHUN, U.S. Air Force, Aero Propulsion Lab., *Dayton, Ohio* 45433

Develop a statistically sound lubricant/gear load capacity determination capability to support Air Force turbine engine lubricant development and qualification test requirements.

A. Survey machines and techniques now used in respect to effects of tooth spacing error, tooth profile modification and tooth surface texture, b. Modify standard test gear designs, c. Modify manufacturer's standard test gears, d. Test for effect of variables keeping two variables constant - varying 1, e. Analyze and report results of tests.

Supporting agency address information: AF Aero-Propulsion Laboratory SFL, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0011, SUBSURFACE STRAIN MEASUREMENT IN COMPOSITE JOINTS FOR AEROSPACE VEHICLES
J.L. MULLINEAUX, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433

The significant airframe size and/or weight reductions offered to the Air Force by high modulus filamentary composite structures may not be realized at other than prohibitively high cost unless the many joints can be designed effeciently. The anisotropic nature of filamentary composites dictates the development of new methods for determining the through-the-thickness load effects in the vicinity of joints where classical lamination theory is a poor model of actual behavior. This program will develop strain sensing techniques to measure strain within composites and in metal-to-composite interfaces of aircraft type joints. Knowledge of the strain patterns will provide more efficient joint designs resulting in cost savings.

An embedded strain gage technique previously validated under contract will be used to determine the strains in the bond line, within the plies of the laminates and along the length of simple double lap joints of boron-epoxy materials. The feasibility of using the technique with graphite-epoxy material will also be determined.

Supporting agency address information: AF Flight Dynamics Laboratory FBT, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0012, MAGNETO-OPTIC STUDIES OF THE ELECTRONIC PROPERTIES OF METALS
E.H. STERN, Univ. of Washington, Graduate School, *Seattle, Washington* 98105 (AF-AFOSR-2779-75)

Metals and their alloys serve many aerospace functions not only as structural materials but also as solid state electronic materials. The objective of this research is the understanding of the electronic structure of dilute and disordered metallic alloys which can lead to the exploitation of their special electronic properties and to special analytical techniques for evaluating metal films and contacts, in situ, on electronic devices. By disordered structures is meant any material system which does not have perfect atomic periodicity. Two types of metal alloys which have large disorder are being studied by means of magneto-optic effects. As model systems crystalline silver-tin alloys and amorphous copper-gold alloys are being studied by the polar reflection Faraday effect. Rare-earth metals and alloys and transition metal compounds are being studied by the magneto-optic Kerr effect as a function of photon energy and temperature. These approaches require careful analyses between experimental measurements and theoretical interpretations.

Supporting agency address information: AF Office of Scientific Research NE, 1400 Wilson Blvd, Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, FLUIDIC THERMAL CONTROLS
T. SUTTON, Garrett Corporation, *Phoenix, Arizona* 85034 (F33615-74-C-3001)

Any type of control system must perform three functions-sensing, computing, and actuation. The environmental control systems (ECS) in current Air Force aircraft use moving-part pneumatic devices and occasionally electrical devices to perform these control functions. The existing ECS controls are heavy and costly, they have poor reliability, and they have very limited computational ability. This effort will investigate the applicability of fluidic controls to aircraft ECS. It is expected that the application of fluidic controls to aircraft ECS will result in substantial improvements in weight, cost and reliability and that using the additional computational ability of fluidics over pneumatics will improve ECS performance and stability.

A complete fluidic ECS will be analyzed, designed, built, tested and evaluated to determine its ability to improve weight, cost and reliability over conventional controls.

Supporting agency address information: AF Flight Dynamics Laboratory FEE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0002, LANDING GEAR ACTIVE SHIMMY CONTROL SYSTEM
P.C. DURUP, Lockheed Aircraft Corporation, *Burbank, California* 91503 (F33615-75-C-3005)

Landing gear shimmy is a chronic problem afflicting many Air Force aircraft which causes significant damage to these aircraft and results in prohibitive life cycle costs. The objective of this work unit is to develop, design, fabricate and test a breadboard version of an active shimmy damper which will detect and control shimmy oscillations over a wide range of conditions. An active shimmy damper will virtually eliminate fatigue caused damage and failure which would otherwise be incurred due to landing gear shimmy oscillations. As a direct payoff, aircraft life cycle costs will be decreased and aircraft ready for use time increased.

It is beyond the capability of present and expected near term shimmy analysis techniques to account for the many in-service changes to landing gear parameters causing shimmy instability. Current passive shimmy damping devices cannot be adjusted to adequately correct the multitude of conditions which cause shimmy. An active shimmy damper detects and initiates automatic action to control shimmy oscillations over a wide range of conditions. The Air Force has experienced considerable trouble with shimmy in the T-37 nose gear. Therefore, a breadboard version of

an active shimmy damping system will be designed, fabricated and tested for a T-37 nose gear.

Supporting agency address information: AF Flight Dynamics Laboratory FEM, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0003, ANALYTICAL STUDY OF THE AERODYNAMICS OF AUGMENTOR WING

T. DUVVURI, Duvvuri Research Associates, *Chula Vista*, *California* (F33615-73-C-4120)

AF function - V/STOL lifting propulsion system, ejector flap. Deficiency - insufficient knowledge of the complex flow structure associated with high performing compact thrust augmenting ejectors. Research - develop a suitable flow model and analytical techniques to predict the performance of an aircraft wing/ejector flap configuration. How research contributes - at present, the ejector flap is a viable concept for attainment of successful STOL aircraft performance. Currently, there exists no suitable, comprehensive, analytical model that successfully predicts ejector performance for a generalized geometry. This research will provide such a model. It will also relate the ejector performance to wing performance through an extension of existing jet flap theory and inclusion of finite aspect ratio effects.

An integral approach is applied to the internal flow structure inside the ejector. A similarity solution is sought for the confined, curved jet in the presence of a pressure gradient that is influenced by varying wall contour and boundary conditions. This solution is to predict the ejector efflux momentum coefficient in terms of a given primary jet condition and a known entrainment level. Perturbation methods will be applied to the 2-D flow field about the wing to extend thin jet, jet-flap solutions to the thick jet ejector flow field. A perturbation method will be used to then extend the 2-D result to the case of finite aspect ratio.

Supporting agency address information: Aerospace Research Laboratory LE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0004, HIGH SPEED MICROPROCESSOR STUDY

R. BARRETT, Hughes Aircraft Company, *Culver City*, *California* 90230 (F33615-74-C-1217)

To examine the higher speed military applications of microprocessors such as radar processing and scan conversion whose data rates cannot be met w/present designs and then define the architectural features and device technology most suitable for these applications.

Define microprocessor designs which combine high production circuit technology w/architectural features of radar signal processors, select optimum device technology (CMOS, TTL, etc), make cost estimates and comparisons based on data and previous experience.

Supporting agency address information: AF Avionics Laboratory TEA, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0005, MODULAR DIGITAL SCAN CONVERTER

W. HOFFMAN, Hughes Aircraft Company, *Culver City*, *California* 90230 (F33615-74-C-1126).

To build a breadboard modular digital scan converter which can serve as a test and evaluation unit for synthesis of digital avionics system for existing and future aircraft. Additionally, the breadboard will become an integral part of an inhouse simulation facility and will be used in the AFAL/AAA digital avionics information system laboratory 'hot bench'.

The breadboard design will be partially based on the results of the modular multisensor display study (PR FY11757325290). The special modules will be designed to meet the needs of DAIS, F-111D, the AC-130 Gunship and the remotely piloted vehicle image processor.

Supporting agency address information: AF Avionics Laboratory AAM, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0006, MICROWAVE AIRCRAFT DIGITAL GUIDANCE EQUIPMENT

R. GOEDHART, McDonnell Douglas Corporation, *Long Beach*, *California* 90808 (DAAB07-74-C-0039)

To evaluate a United Kingdom portable microwave landing guidance system known as MADGE (Microwave Aircraft Digital Guidance Equipment).

A laser tracker will be used to measure system accuracy and system coverage characteristics. Various test sites will be selected to examine system suscepability to multipath signals. Simulation techniques will be employed to test system in a high denisty aircraft environment.

Supporting agency address information: ECOM Army Avionics Laboratory, Army Electronics Command AMSEL-VL-N-L, Ft. Monmouth, N.J. 07703

SUPPORTED BY U.S. Dept. of Defense - Army

4.0007, ANALYTICAL AND SEMI-NUMERICAL METHODS OF FLOW CALCULATIONS

M.D. VANDYKE, Stanford University, School of Engineering, *Falo Alto*, *California* 94305 (AF-AFOSR-2649-74)

Both present and future af aerospace vehicles will be required to fly at high speeds and maneuver at all speeds. This will require that new and improved techniques be developed to incorporate viscous flows, compressible flows, turbulent flows and vortices, and aerodynamic noise efficiently and rationally into design methods. This research will improve existing prediction methods and develop new analytic tools to complement the growing emphasis on large scale numerical computation of practical flow problems. Under particular investigation will be such techniques as the method of series truncation applied to such problems as intersecting boundary layers, computer extension of perturbation series and improved perturbation series combined with analysis and singular perturbation methods applied to problems ranging from slow viscous flows to aerodynamic noise, and local and self similar solutions applied to problems such as models of turbulence and the roll-up of vortex sheets.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd, Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0008, THREE CHANNEL UP-CONVERTER

UNKNOWN, Aertech Industries Inc., *Sunnyvale*, *California* 94086 (048817 (TRAIS NO.))

Design one (1) Three Channel Up-converter in accordance with the 'System Specification No. TEC-0120 for a Three Channel Up-converter' dated November 15, 1973, hereby made a part of this contract. The design data shall include a Test Plan for the final performance test of the Up- converter. The converter is to be used on a KC-135 aircraft. The Up- converter shall convert three separate 70MHz, OdBm input signals to three separate 1650 MHz, O dBm output signals.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

4.0009, STEERABLE BEAM ARRAY ANTENNA FOR USE IN ATS-F TEST PROGRAM

UNKNOWN, Ball Brothers Research Corp., *Boulder*, *Colorado* 80301 (048661 (TRAIS NO.))

The Contractor shall design and fabricate a steerable beam, L-band array antenna suitable for installation on the surface of the KC-135 aircraft. Installation will be approximately at Station 390, which is forward of the main cargo door. The array antenna shall be designed for low power operation in the receive mode only. The Contractor shall, however, indicate the adaptability of his design to operation in the transmit mode at 1645-1660 MHz and at an average power of approximately 100 watts.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

4.0010, DIGITAL FILTER DESIGN AND IMPLEMENTATION METHODS
T. BRUBAKER, Colorado State University, School of Engineering, *Fort Collins, Colorado* 80521 (F33615-73-C-1253)

The objectives of this program are to determine filter design and implementation techniques which are applicable to digital avionics systems, to establish the effects of word lengths and sampling rates on filter errors, to demonstrate filter implementation techniques using programmable memories with multiplexed filter controllers, and to establish filter hierarchy schemes which increase system reliability.

Using a representative set of avionic signal processing tasks, this program will examine both time domain and frequency domain synthesis approaches which have application over a broad class of filter requirements. Using programmable memories and general purpose digital computer, and an analog computer, several candidate designs will be simulated and evaluated against program objection. A real time demonstration will be conducted of suitable designs.

Supporting agency address information: AF Avionics Laboratory AAA, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0011, HELICOPTER TRANSMISSION VIBRATION AND NOISE REDUCTION PROGRAM
R. BOSSLER, Kaman Aerospace Corporation, *Bloomfield, Connecticut* 06002 (DAAJ02-74-C-0039)

To generate clear, concise and usable, analytical tools that would, during the design stage of a program, allow the design team the capability to perform trade studies that would yield drive train components that are dynamically quiet, with inherently longer life and reduced vibration and attendant noise levels.

(1) Construct analytical prediction technique and predict vibration/noise levels of baseline test transmission- (2) Test baseline transmission- (3) Refine analysis/design and fabricate components to reduce vibration/noise levels of baseline transmission- (4) Test modified transmission- (5) Compare results and conduct users conference.

Supporting agency address information: AVCOM Eustis Directorate, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

4.0012, ANTENNA ADAPTER APPLIQUE FOR PHASE FRONT HOMING
N. MARCHAND, Marchand Electronic Labs. Inc., *Greenwich, Connecticut* 06830 (NOT REPORTED)

The objective of this program is to develop an applique unit that will provide compatibility between an/arc-114 radios equipped with phase front homing and existing aircraft homing antennas. The phase front homing technique offers significant improvement over conventional homing systems when used in standard VHF/FM receivers, however, existing homing antennas are incompatible with this technique. The development of an applique would complete the phase front homing system and, therefore, insure the proper fielding of phase front homing into the aircraft system.

It is envisioned that the applique will be a small, lightweight unit mounted between the homing receiver and the homing antennas. When phase information is lost, the applique will automatically provide a signal to the homing indicator indicating the true direction to the target.

Supporting agency address information: ECOM Avionics Laboratory US Army Electronics Command, Fort Monmouth, N.J. 07703

SUPPORTED BY U.S. Dept. of Defense - Army

4.0013, ACCURATE PREDICTION METHODS FOR THE DRAG OF AIRCRAFT AND MISSILE
H. MCDONALD, United Aircraft Corporation, *Hartford, Connecticut* 06118 (F33615-73-C-4119)

AF function - supersonic and hypersonic aircraft and missiles. Deficiency - prediction methods are limited in accuracy and range of validity. Research - develop a numerical method for solving turbulent boundary layer over aircraft including inviscid-viscous interacting and separated flow regions. How research contributes - accurate prediction method for the friction drag of aircraft and missile has not yet been established. The deficiency lies in the fact that in actual high speed flight condition pressure gradient, heat transfer, viscous-inviscid interaction and flow separation commonly occur on the aircraft and missile. The current development of turbulent boundary layers cannot adequately treat flow deviation from 'equilibrium' conditions. The present project is designed to develop an accurate method for turbulent boundary-layer calculations including the interaction of turbulent shear flow with inviscid streams involving flow separation.

Two areas are to be emphasized in the technical approach. First, the turbulence model which describes the phenomenon of turbulence in viscous-inviscid interacting flows will be developed and validated. Second, a numerical scheme which can overcome difficulties of convergence and stability in the separated flow region will be developed. In particular, the alternating direction numerical scheme will be implemented.

Supporting agency address information: Aerospace Research Laboratory LH, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0014, SATELLITE IMAGE QUALITY SIMULATION STUDY
B. BOYCE, Perkin Elmer Corporation, *Norwalk, Connecticut* 06852 (F30602-74-C-0209)

To provide generalized techniques and criteria for evaluating, as a function of S/N and System OTF, the image quality of atmospherically degraded space object imagery.

Computer simulation and modeling will be used to provide System OTF's which are a function of exposure time, spectral bandwidth, wavefront compensation, aperture diameter and atmospheric strengths of turbulence. These, then, will be combined with digitized images of known objects taking into account proper orbital parameters. White and non- white noise will then be added in a systematic manner to produce degraded noisy images corresponding to pre and post detection efforts. The resulting images will be evaluated by both subjective and mathematical techniques to establish image quality criteria for future efforts under the ARPA TEAL BLUE II Program.

Supporting agency address information: Rome Air Development Center OCS, Griffiss AFB, N.Y. 13440

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0015, FLUIDIC THERMAL CONTROLS
J. GRIFFITH, United Aircraft Corporation, *Windsor Locks, Connecticut* 06096 (F33615-74-C-3031)

Failures of aircraft equipment have been largely attributed to the effects of the environmental control system (ECS). One of the elements of the ECS which has had limited reliability, has been costly and unnecessarily heavy is the control system itself. The control system must provide for sensing, computing and actuation. It has been primarily pneumatic, occasionally electromechanical, but always dependent upon moving part components. This effort will investigate the applicability of fluidic controls to aircraft ECS. It is expected that the application of fluidic controls to aircraft ECS will result in substantial improvements in weight, cost and reliability and that using the additional computational ability of fluidics over pneumatics will improve ECS performance and stability.

A complete fluidic ECS control system will be analyzed, designed, built, tested and evaluated to determine its ability to improve weight, cost and reliability over conventional controls.

Supporting agency address information: AF Flight Dynamics Laboratory FEE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0016, RADAT FLIGHT TESTS
L. HOFFMAN, Sperry Rand Corporation, *Clearwater, Florida* 33517 (F33615-74-C-1236)

To conduct field experiments utilizing a 35 GHz radiometer to determine the effects of adverse weather on radiometer per-

formance and to determine the feasibility of applying radiometric techniques to AF systems utilizing active beacons.

The K-510 tracker (contractor-owned equipment) and minirad (GFE) systems shall be used in the performance of this effort. This effort will (1) modify the K-510 tracker and minirad receiver for conducting experiments between B620 (AFAL) and the Trebein Road Site, and furnish precision instrumentation for data collecting during these tests, (2) provide technical support during these tests at WPAFB, and (3) analyze the resulting data and prepare a comprehensive test report.

Supporting agency address information: AF Avionics Laboratory TEM, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0017, NULL STEERING FEASIBILITY DEMONSTRATION

A. ROY, Radiation Incorporated, *Melbourne*, *Florida* 32905 (F33615-74-C-1100)

To verify the RPV relay null-steering antenna design concept developed under contract F33615-73-C-1125 a digitally controlled, fully adaptive, 16 element, null-steered C-band antenna array breadboard will be fabricated. This array will consist of the C-band radiating elements, the four bit diode phase shifters cascaded w/5 bit vernier varactor phase shifters, associated driver circuits, a signal combiner, IF circuits, associated logic circuits and computer processor. The array will be designed so that the digital adaptive array algorithms known as beam space and random search can be implemented and evaluated in a comparison of the hardware performance against the computer simulated performance. Antenna pattern measurements will be used to demonstrate the design concept, evaluate antenna performance and scope the quantity of performance degradation associated with a hardware implementation.

The components required for the 16-element adaptive array feasibility model will be procured and/or fabricated and assembled. Major emphasis will be on defining any problem areas which exist in implementing the hardware required to build a fully adaptive array flight model that will yield satisfactory performance commensurate w/the RPV relay application. Effects of antenna performance degradation due to non-linearities in phase- shifters, amplifiers, and down-converters will be investigated as functions of temp, frequency, and phase shifter phase state. The performance of the overall system when using the beam space/ random search algorithm will be evaluated. Factors such as null-steering capability and acquisition time will be compared w/computer simulations, and theoretical and experimental results will be documented. Based on the results, specifications for designing and fabricating an improved flight model will be documented.

Supporting agency address information: AF Avionics Laboratory AAI, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0018, A STUDY OF REYNOLDS NUMBER EFFECTS ON THE BOATTAIL FLOW CHARACTERISTICS OF A SIMULATED NACELLE

J.A. BLACKWELL, Lockheed Georgia Company, *Marietta*, *Georgia* 30060 (F33615-74-C-4021)

AF function - data acquisition on transonic aerospace vehicles. Deficiency - inability to extrapolate from low Reynolds number wind tunnel data to high Reynolds number flight conditions. Research - conduct wind tunnel tests over a large enough Reynolds number range to acquire data covering the Reynolds numbers present in ordinary wind tunnels to those present in full scale flight. How research contributes - develops means of extrapolating ordinary low Reynolds number wind tunnel data so that the data can be applied to flight conditions with a minimum of errors. The objective is to identify Reynolds number effect trends through a large range of Reynolds numbers under constant conditions, i.e. Using the same model and facility for the entire test. Included are studies of flow separation, transition and drag changes with Reynolds number. This program's payoff to the Air Force will be in greater reliability of low Reynolds number data as applied to full scale aircraft, thus reducing the need for flight test data and increasing design efficiency, each of which will reduce the cost and time necessary for current production procedures.

An axisymmetric body of revolution will be tested to determine afterbody drag, pressure distributions and separation characteristics through a large range of Reynolds numbers.

Supporting agency address information: Aerospace Research Laboratory LH, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0019, PROCESSOR ARCHITECTURE SIMULATION

R.T. CHIEN, Univ. of Illinois, School of Engineering, *Urbana*, *Illinois* 61801 (F33615-74-C-1112)

To develop the capability to simulate and evaluate different processing systems for use in future aerospace applications. By examining the processor architecture and the software requirements simultaneously, hardware/software trades can be evaluated without extensive hardware development. Hence a wide spectrum of processor systems can be examined with only the most appropriate systems developed for AF applications.

To develop the simulation hardware and software required to support processor system investigations. The processor architecture simulator would then be delivered to AFAL as a tool to allow AF personnel to investigate and evaluate processor system capabilities in response to future aerospace requirements.

Supporting agency address information: AF Avionics Laboratory AAA, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0020, DYNAMIC CROSSED-FIELD PHOTOMULTIPLIER

O.L. GADDY, Univ. of Illinois, School of Engineering, *Urbana*, *Illinois* 61801

A study of methods of incorporating internal demultiplexing capability in the dynamic cross field photomultiplier (DCFP) will be continued. The major thrust of the research will concentrate on further experimental and theoretical investiations. In particular, the technique of dynamic deflection demultiplexing will be thoroughly explored and emphasized. Experimental studies will include the use of subharmonic RF electric fields as well as the DC field in the deflection region. Analysis of electron dynamics in the deflection region will be performed for both the single electron case and for the statistical distribution of energies of electrons entering the deflection region. Monte Carlo techniques and computer simulation will be used to predict the performance of experimental devices. This research is directly applicable to very high data rate optical communication systems.

SUPPORTED BY U.S. Natl. Science Foundation

4.0021, BATTERY TEMPERATURE CONTROLLED VOLTAGE REGULATOR

A. OSER, Chrysler Corporation, *New Orleans*, *Louisiana* 70129 (DAAE07-74-C-0122)

The main thrust of this effort is to develop a battery temperature probe to determine the feasibility of varying the battery charging voltage corresponding to the battery electrolyte temperature for the purpose of prolonging battery life.

A battery temperature probe will be designed, and 50 prototypes fabricated for laboratory and field tests. The drawings and a final technical report will be furnished.

Supporting agency address information: Tacom Armor Material and Component Division, U.S.A. Tank-Automotive Command Mobility Systems Laboratory, Warren, Michigan 48090

SUPPORTED BY U.S. Dept. of Defense - Army

4.0022, SYSTEM MODELING BASED ON STEADY STATE FREQUENCY RESPONSE MEASUREMENTS

W.J. RUGH, Johns Hopkins University, School of Arts, *Baltimore*, *Maryland* 21218

AF function - system identification. Deficiency - need for quantitative methods to analyze the data obtained from steady-state frequency response (or continuous wave - CW) experiments. Research - to find methods of obtaining simple (low-order) models which represent the dominant system behavior and

to characterize the properties of these models. The data obtained from CW experiments is to be the basis for the construction of the models. How research contributes - provide an exact method of interpreting steady-state frequency response system identification experiments.

CW testing is an experimental procedure that is currently state-of- the-art and extensively instrumented, it is important that the exact nature, usefulness and limitations of the information extracted from these experiments be understood. A limitation of many current instrumentation schemes is that while magnitude CW measurements may be obtained with a high degree of accuracy the measured phase information is somewhat less reliable. Recognizing this instrumentation limitation, this effort will attempt to exploit magnitude only measurements as the basis for identification. The characterization of the ambiguity in the identified representation resulting from the elimination of the phase information, and the institution of a consistency check on additional, possibly redundant, data will also be investigated. Effort will also be directed towards the extension of this identification technique to the identification of a representation of nonlinear dynamical systems, thereby allowing the use of current experimental instrumentation.

Supporting agency address information: Aerospace Research Laboratory LB, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0023, COMMON APERTURE SENSOR DESIGN (IR-VIS) STUDY

C. SCHUBERT, Westinghouse Electric Corp., *Baltimore, Maryland* 21227 (F33615-74-C-1178)

To detail present technology and evaluate approaches to the common window-common aperture concept for electro-optical sensors.

Current and near term technology will be evaluated in the areas of windows, spectral seperators and common sensor optics. Various detailed layouts will be evaluated for their predictable effects on performance. A common aperture sensor will be planned in detail. The emphasis will be on optical designs which can be used with already developed scanners.

Supporting agency address information: AF Avionics Laboratory RSP, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0024, TECHNICAL SUPPORT FOR THE MICROWAVE LANDING SYSTEM DEVELOPMENT PROGRAM

UNKNOWN, Vitro Corporation of America, *Silver Spring, Maryland* 20910 (036303 (TRAIS NO.))

Technical Services in support of the many engineering tasks that must be accomplished during the development program for the microwave landing system (MLS). The basic role of the contractor is to provide direct assistance and support to the MLS Program Management Office in the performance of its system engineering functions. This includes active participation in planning, coordinating, and assessing results of development efforts of MLS program.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

4.0025, EVALUATION OF ACOUSTIC DOPPLER RADAR

J.C. KAIMAL, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - low level performance of remotely-piloted vehicles. Laser propagation and optical tracking systems. Deficiency or opportunity - knowledge of effects of turbulence on Air Force systems operating in or through the boundary layer is inadequate. Objective - determine the performance characteristics of an acoustic doppler radar for measuring winds remotely for a wide range of meteorological conditions. How development contributes - development and use of a remote device for measuring winds to a height of several hundred feet is needed at all Air Force test ranges and bases where instrumented tall towers are prohibited or impractical.

The approach is to perform a quantitative evaluation of an existing acoustic doppler radar by acquiring comparison data with wind sets mounted on a tall tower. The comparison tests will be conducted on the 1500-foot tower at the AEC Nevada test site, chosen for its high repeatibility of suitable wind and temperature conditions for this test.

Supporting agency address information: AF Cambridge Research Laboratories LY, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0026, UPPER AIR MEAN WINDS FOR RE-ENTRY VEHICLES

A.J. KANTOR, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

Air Force function - design and operation of re-entry bodies and other aerospace vehicles. Deficiency - need for climatological wind information for wind-affected missile and aircraft systems, particularly in the event of unavailability of real-time wind forecasts. Objective - compare actual observed upper-air winds with theoretically deduced winds which are presently used to provide wind velocities for aerospace vehicle and operations how research contributes - improved climatological wind data will be an important factor in the design of various re-entry vehicles as well as in operational use of wind-affected systems when real-time data and forecasts are unavailable.

Up to eight years of mean monthly winds, based on actual observed velocities at more than 500 locations, are being examined for nine standard pressure altitudes between 5,000 feet (850 MB) and 78,000 feet (30 MB). The mean monthly velocities observed at each station and level will be related to the deduced mean monthly winds to determine the limitations and inaccuracies of the deduced values. North-south and east-west components will be machine analyzed and compared to determine differences at these levels over the northern hemisphere, tropical regions and, if feasible, over the southern hemisphere.

Supporting agency address information: AF Cambridge Research Laboratories LK, L. G. Hanscom AFB, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0027, ATCRBS SIMULATION FACILITY SUPPORT

UNKNOWN, U.S. Air Force, *Bedford, Massachusetts* (048664 (TRAIS NO.))

The objective of this procurement is two-fold: 1) to provide upgraded Fast Digital Processor (FDP) hardware and maintenance of the FDP/Univac Computer Facility; and 2) to provide software support for conversion of TSC's FORTRAN Simulation of the Air Traffic Control Radar Beacon System (SOAR) to FDP assembly language. The achievement of these objectives requires that a certain minimum of FDP/Univac Computer time be made available to TSC.

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SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

4.0028, DESIGN, FABRICATE AND INSTALL A LOW VOLTAGE/REPETITIVE PULSE GENERATOR FOR THE ARES EMP SIMULATION FACILITY

R. HARRISON, Ion Physics Corporation, *Burlington, Massachusetts* 01803 (F29601-73-C-0054)

To design, fabricate and install a low voltage/repetitive pulse generator at the ARES facility for use in EMP survivability/ vulnerability testing of DOD systems. The generator will be capable of producing a double exponential pulse with a risetime variable from 6NS to 15NS and a decay time to 10 percent of peak of approximately 575NS. The peak voltages will be approximately 300KV in the single shot mode and 50KV in the repetitive mode.

The contractor will design, fabricate and install a low voltage pulser system, LVPS, at the ARES facility. This system will consist of a charging network, either a Van de Graaff or Marx generator, an energy storage network consisting of high voltage capacitors, a high voltage switch capable of firing either in the single shot or repetitive facility, and ancillary support equipment.

Supporting agency address information: AF Weapons Laboratory ELS, Kirtland AFB, N. Mexico 87117

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0029, VUILLEUMIER (VM) TEMPERATURE CONTROLLER
R.H. SPENCER, Arthur D. Little Incorporated, *Cambridge, Massachusetts* 02140 (F33615-75-C-3002)

A temperature controller is an important part of the cryogenic cooling system which cools infrared detectors, lasers, and superconductors for reconnaissance and surveillance. Available temperature controllers which can withstand the temperature-altitude environments of today's aircraft are not reliable. To date a more reliable temperature controller would be very expensive. The Air Force needs dependable and economical temperature controllers for aircraft applications. Under this effort a lower cost, more reliable temperature controller will be designed, built, and delivered to the AF to be life tested at AFFDL.

Design, fabricate, and deliver to the AF a more economical, more reliable temperature controller. This will be a 13 month effort with a detailed review of design after 60 days. A MTBF of 10,000 HRS is desirable. The environmental testing will be done by the contractor while the life tests will be done by AFFDL.

Supporting agency address information: AF Flight Dynamics Laboratory FEE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0030, NAVY VEHICLE DESIGN AND CONSTRUCTION - ON THE DEVELOPMENT OF A UNIFIED THEORY FOR VORTEX FLOW PHENOMENA FOR AERONAUTICAL APPLICATIONS
S.E. WIDNALL, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (N00014-67-A-0204-0085)

To establish means for the reliable prediction of complex vortex flows for understanding, predicting and optimizing their performance in relation to aircraft surfaces, as well as effecting solutions to their problems.

A critical analysis of existing mathematical models for individual elements in the vortex-wing flow field will be made together with examining their ability to predict the response of the flow field elements to external pressure gradients, necessary to construct a theory involving interactions between wings and free vortices.

Supporting agency address information: Office of Naval Research 461, Arlington, Va. 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0031, ATS-F LABORATORY INSTRUMENTATION AND DATA ACQUISITION REQUIREMENTS
UNKNOWN, Proteon Associates Inc., *Waltham, Massachusetts* 02154 (048583 (TRAIS NO.))

The object of the proposed effort is to define laboratory and calibration procedures, test equipment performance requirements and test equipments. The test set-up must fulfill the requirement of the DOT/TSC ATS-F test plan in a manner which optimally uses available equipment and which uses redundancy and back up measurement approaches to accomodate equipment failures. Finally, the test set up must be compatible with other experimental routines. Analyses will be conducted of the impact of the AEROSAT system performance specification upon L- band avionics design.

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SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

4.0032, READ DOUBLE DRIFT HYBRID STRUCTURES
C. KIM, Raytheon Company, *Waltham, Massachusetts* 02154 (F33615-74-C-1049)

To develop improved impatt diode structures which would yield ten watts CW at X-band and five watts CW at Ku-band with 40 percent efficiency. These diodes will then be used in the development of 30 watt CW X-band and 15 watts CW Ku-band linear amplifiers.

To develop both read diodes and double drift structures in gallium arsenide. The development of epitaxial techniques for growing the optimum structures will be included.

Supporting agency address information: AF Avionics Laboratory TEM, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0033, ADVANCED THERMOPLASTIC MODULATOR
I. CINDRICH, Environmental Res. Inst. Mich., *Ann Arbor, Michigan* 48107 (F33615-74-C-1037)

Optical data processing systems are applicable to enhancement, analysis, filtering, and identification of spatial and temporal signals in noise. The thermoplastic modulator is considered the most promising material to achieve laboratory and field capability for real-time input of wideband signals to optical processing systems for signal analysis including correlation and spectrum analysis. Time bandwidth products above 10 over 6 are desired with 30DB linear dynamic range. Bandwidths up to 100 MHz or greater are desirable for radar and ELINT applications. This effort is to improve, and carefully measure the performance of 100 MHz rotating disc and fixed plate modulators (laboratory models).

The electron beam scanned thermoplastic modulator will continue to be developed. Detailed and accurate performance measurements (bandwidth, resolution, dynamic range, etc) will be continued and improved. Problems, if any, encountered in the FY73 effort will be attacked. Deliverable laboratory hardware designs will be formulated with 100 MHz bandwidth and 10 over 6 time-bandwidth product. FY73 effort is contract F33615-73-C-1113 at Environmental Research Institute of Michigan.

Supporting agency address information: AF Avionics Laboratory TEL, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0034, BRASSBOARD THERMOPLASTIC MODULATOR
J. ROWE, Environmental Res. Inst. Mich., *Ann Arbor, Michigan* 48107 (F33615-74-C-1208)

Optical data processing systems are applicable to enhancement, analysis, filtering, and identification of spatial and temporal signals in noise. The thermoplastic modulator is considered the most promising material to achieve real-time input of wideband signals to optical processing systems for signal analysis including correlation and spectrum analysis. Time bandwidth products above 10 over 6 are desired with 30DB linear dynamic range. Bandwidths up to 100 MHz or greater are desirable for radar and elint applications. Development has advanced to the point where a lab type brassboard device, suitable for system concept demonstration, needs to be designed and constructed for integration into a lab ih demonstration system. This effort will deliver such a thermoplastic modulator.

A deliverable lab brassboard electron beam scanned, fixed plate, thermoplastic modulator will be designed with 100 MHz bandwidth, 10 over 6 time-bandwidth product, 30DB linear dynamic range, and approximate diffraction-limited optical performance in the Fourier plane. The brassboard design will embody the basic techniques already demonstrated in the lab breadboard thermoplastic modulator and will incorporate optimized system parameters for maximum performance and reliability. The device will be fabricated, packaged, evaluated and delivered in FY75.

Supporting agency address information: AF Avionics Laboratory TEL, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0035, INVESTIGATION OF THE TURBULENT MIXING PHENOMENA IN THE HIGH SPEED EXHAUST FLOW FIELD OF THE CHEMICAL LASER 12111-RTL
C.R. WIMBERLY, Univ. of Mississippi, School of Engineering, *University, Mississippi* 38677 (DAHC04-74-G-0046)

To provide a greater understanding of the properties that affect mixing in the chemical laser using photograhic and analytic means. This research will make a substantial contribution toward minimizing mixing problems and maximizing laser performance in

a major program which the Army is currently pursuing on chemical lasers. Lasers are considered of pressing importance for a number of Army applications, including range- finding.

Research efforts will include providing photographic impressions of the rarefield, chemically reacting gases under high speed conditions that are frequently present in chemical laser devices, reconstruction of holograms into shadowgraphs, schlierens and interferograms for analytic purposes, providing interpretation and analyses of the supersonic mixing phenomena, and performing diagnostic evaluation of the laser flow field from theories and test data.

Supporting agency address information: OCRD Army Research Office Box CM Duke Station, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

4.0036, AIRCRAFT HYDRAULIC SYSTEM PERFORMANCE ANALYSIS

N. PIERCE, McDonnell Douglas Corporation, *St Louis, Missouri* 63166 (F33615-74-C-2016)

The purpose of this program is to provide the criteria necessary for conducting comprehensive dynamic analysis of aircraft hydraulic systems. This procedure will include constructing computer models of basic hydraulic systems components and experimentally verifying their performance.

The program objective will be reached by- 1. Selecting the hydraulic components (pumps, lines, valve seals, fluids, etc.) to be computer simulated. 2. Developing dynamic equations for these components. 3. Incorporating these equations in systems mathematical modes. 4. Generating and verifying computer programs employing the math models. 5. Training AFAPL project engineers to utilize the computer programs.

Supporting agency address information: AF AERO-Propulsion Laboratory POP, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0037, VISCOUS-INVISCID INTERACTION OF TRANSONIC AIRFOILS

A. VERHOFF, McDonnell Douglas Corporation, *St. Louis, Missouri* 63166 (F33615-73-C-4062)

AF function - transonic aircraft. Deficiency - prediction methods are limited to inviscid techniques. Research - develop a numerical method for solving transonic flow over an airfoil including viscous separated regions. How research contributes - progress has been achieved recently in the ability to compute the pressure distribution over a transonic airfoil. Time dependent methods or relaxation approaches have produced successful solutions of the finite difference inviscid fluid dynamic equations for transonic flows. The resulting pressure distributions have agreed well with experiment except in the regions of boundary layer separation near the shock wave and locally near leading edge and trailing edge separation. This new investigation proposes to add the viscous effects to the governing equations and solve for the flow field for both laminar and turbulent conditions. Correlations between experiment and the numerical results will then be obtained.

Supporting agency address information: Aerospace Research Laboratory LH, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0038, RADIATION HARDENED D/A SUBSYSTEM DEVELOPMENT

W. HEAGERTY, Radio Corporation of America, *Camden, New Jersey* 08102 (F33615-73-C-1283)

Develop a D/A converter which satifies the electrical and environmental requirements of the Survivable-MOS-Array-Computer (SMARC) input/output system. Emphasis is on a hardened MOS/SOS process which is capable of the integration of both linear and digital circuits on a common substrate. Important electrical characteristics are- 8-bit resolution, 0.3 percent accuracy, 0 to plus 5 volt output range, less than 2.5k ohm output impedance, less than 100 msec conversion time, less than 200 mwatt power dissipation. Nuclear environments include one megarad (Si), 10 exp 15 neutrons per sq-cm, and 10 gigarad (Si) per second.

A charge-equalizing conversion technique will be implemented using both standard and hardened MOS/SOS integrated circuit processing. This approach allows the fabrication of the D/A decoder on the same substrate w/digital timing and operational amplifier circuitry. The two matched capacitors are fabricated by the same dielectric material and in the same processing step as the MOS gates. This procedure is compatible with the various hardened gate dielectric processes being developed under AF sponsorship. Photocurrent compensation and SOS isolation are used for photocurrent hardening.

Supporting agency address information: AF Avionics Laboratory TEA, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0039, OMEGA-FEASIBILITY EQUIPMENT

J.A. SULLIVAN, Bendix Corporation, *Hackensack, New Jersey* 07608 (045370 (TRAIS NO.))

This program calls for the design, development, fabrication and installation of a feasibility model of differential Omega system. This system consists of three equipment sub-systems. The ground sub-system shall receive Omega signals, measure the phase value of each received signal relative to an oscillator signal phase, calculate phase difference and convert correction value into a fixed message format. The airborne sub-system shall receive Omega signals, measure its phase relative to oscillator signal, and compute the present position of an aircraft in a coordinate system. The communication sub-system shall convert ground sub-system Omega phase difference correction messages to transmittable form and send to air-borne sub-system for position computation.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - F.A.A.

4.0040, EXPERIMENTAL INVESTIGATION OF INDUCED FLOW MODELLING ON SUPERSONIC AIRCRAFT

I.E. VAS, Princeton University, School of Engineering, *Princeton, New Jersey* 08540 (F33615-73-C-3133)

Aerodynamic heating to high speed military airframes is a severe design constraint to the system which results from technological deficiencies in our ability to predict and reduce such heating. The severity increases as MACH number increases and it is particularly important in the interaction region caused by wings, control surfaces and/or inlets. The mechanism for such heating in the practical turbulent boundary layer case is not known; however such an understanding would allow us to both reduce systems acquisition costs through reduced systems testing and to lower production costs through reliance on lower temperature materials. The objective of this program is to develop a model for such interactions based upon detailed and definitive flow field probing in regions of interference induced flow fields which aid in development of design techniques.

Wind tunnel models will be fabricated and tested at the Princeton University High Pressure Blow Down Facility to evaluate the flow field characteristics caused by induced flow mechanisms. An analytical flow model will be developed based upon empirical measurements to correlate and extrapolate tunnel data and extend our prediction capability to new flow situations.

Supporting agency address information: AF Flight Dynamics Laboratory FXG, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0041, EFFECTS OF INITIAL BOUNDARY LAYER CONDITIONS ON JET MIXING

W.G. HILL, Grumman Corporation, *Bethpage, New York* 11714 (F33615-74-C-4082)

AF function - research and development of highly efficient thrust augmenting ejectors. Deficiency - need to correlate jet mixing rate with jet initial conditions. Research - investigation of the effect of initial boundary layer thickness, state and active stimulation by sound means. How research contributes - increase understanding for scaling of jet mixing from model tests to full scale tests.

Supporting agency address information: Aerospace Research Laboratory LE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0042, CHEMICALLY PUMPED ATOMIC LASER STUDY
J.A. BLAVER, Bell Aerospace Company, *Buffalo, New York* 14240 (F29601-74-C-0063)

Attempt to demonstrate electronic transition laser action in an atomic species in a case where the population inversion is created by energy transfer from a chemically created exited module.

A shock tube will be used to create sufficient amounts of atomic materials. These will be expanded through an endwall nozzle into an optical cavity. The fuel will be injected into the atomic stream at the nozzle throat, to mix and react with one of the atomic species, producing a vibrationally excited molecule. This molecule will transfer energy to the other atomic species. Initial experimentation will be done to maximize chemiluminescense in the other optical cavity. Once optimum operating conditions have been established, a laser demonstration will be attempted. The system of primary interest is pumping of atomic iodine by energy transfer from the vibrationally excited HF, created by the reaction between F and H2. Other atomic laser systems will be investigated experimentally.

Supporting agency address information: AF Weapons Laboratory ALD, Kirtland AFB, N. Mex. 87117

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0043, NOVEL CHEMICAL LASER SYSTEMS
T.A. COOL, Cornell University, School of Mechanical Engin., *Ithaca, New York* 14850 (AF-AFOSR-2550-73)

Future Air Force operations in reconnaissance, communications and other areas will require new laser systems of varied output frequencies, higher operating efficiencies, increased power, and lower weight. Chemical lasers indicate a high probability of contributing to some of the future needs. This research is a systematic search for reaction systems which would provide pulsed chemical laser operation at visible wavelengths. These systems involve the formation of metal oxides and halides in electronically excited states. Candidate reactions will be studied using rapid initiation techniques such as electric discharge and E-beams into premixed reagent combinations. For metal-containing compounds with low volatility, appropriate vapor pressures will be obtained in a heated section of a shock tube and shock-induced supersonic flow will be used to mix the metal and oxidant before discharge initiation of the reaction is performed. These studies at different pressures, compositions and discharge characteristics will be combined with the results of absolute photon yield measurements to determine the most promising candidates for more definitive laser cavity tests.

Supporting agency address information: AF Office of Scientific Research NC, 1400 Wilson Blvd, Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0044, POWER DISTRIBUTION SYSTEM
UNKNOWN, Johnson Electrical Corporation, *New York, New York* 10018 (048873 (TRAIS NO.))

The work to be performed consist of furnishing services, labor, equipment and materials for the construction and installation of a 60 Hz power distribution system and the installation of signal cables in existing duct bank conduits for the Wake Vortex Avoidance System at the JFK International Airport, New York.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

4.0045, TURBULENT FLOWS ON ABLATING NOSE TIPS
R. VAGLIOLAURIN, New York University, School of Engineering, *New York, New York* 10453 (F44620-74-C-0074)

Air Force reentry systems using ablative heat protection sometimes encounter aerodynamic difficulties not predicted by current analytical or numerical modelling techniques. The proposed research is a direct attack upon this lack in understanding of supersonic turbulent boundary layer heat transfer with ablation. The effort will be maiply analytical and will have the objectives (a) improved determination of self- preserving sub-critical shapes, (b) definition of thresholds for boundary layer separation, and (c) investigation of the dynamical and thermal responses of the turbulent flow to spatially amplifying oscillations. In view of an extensive modeling effort for the inviscid flow field underway elsewhere, the results of the proposed research will be developed in a form suitable for synthesis into an overall model, thus complementing other work.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd, Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0046, APPROACH/LANDING RADAR DEVELOPMENT
S. DRAKE, Riker Maxson Corporation, *New York, New York* 10017 (F33615-72-C-1245)

In the event of ILS failure during category III operations, no back-up guidance exists to complete the mission or assess the situation. The objective is to develop hardware which will provide to the pilot a back-up guidance capability which is useful as a monitor during low visibility operations in the terminal area. The system is to be a self- contained airborne unit, using no ground aids.

This is a contractual effort to develop a high resolution radar capable of penetrating adverse weather at a distance of approximately 5 miles from the runway. The performance of the system will be determined through a flight test program using a suitably modified C-141. The ALR picture will be displayed on an electronic attitude director indicator (EADI) and on a head-up display (HUD). The ALR picture will be displayed both by itself and in conjunction with the EADI/HUD symbology.

Supporting agency address information: AF Flight Dynamics Laboratory FGS, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0047, STUDIES OF ANTENNA ARRAY SYNTHESIS AND SOLID BODY RADIATION PROBLEMS
R.F. HARRINGTON, Syracuse University, School of Engineering, *Syracuse, New York* 13210 (F19628-73-C-0047)

AF function - aerospace antenna systems. Deficiency - dependable, computer aided synthesis techniques are required. Research - antenna array synthesis methods, reactive loading for solid body radiation control. How research contributes - provides handbook type computer design programs for arrays of wire antennas and loading schemes to control radiative properties of bodies. Array work will consider practical top-loaded wire antennas over an imperfectly conducting ground. Effects of loading geometry and ground screen will be considered. Matrix methods for broad-band operation of arrays will be developed as well as techniques for non-uniform and conformal arrays. Also the radar scattering from conducting bodies in the resonance region will be related to the body shape and size. Frequency variation of amplitude and phase of the scattered fields and positions and Q of the resonances will be determined.

Supporting agency address information: AF Cambridge Research Laboratories LZ, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0048, BOATTAIL DRAG AS AFFECTED BY REYNOLDS NUMBER UP TO 10 SUPER 8
J.D. LEE, Ohio State University, School of Engineering, *Columbus, Ohio* 43212 (F33615-73-C-4165)

AF function - data acquisition on transonic aerospace vehicles. Deficiency - inability to extrapolate from low Reynolds number wind tunnel data to high Reynolds number flight conditions. Research - acquire wind tunnel data over a sufficiently large Reynolds number range to span the gap left between the data of most wind tunnels and the data of flight tests. How research contributes - develops means of accurately applying normal wind tunnel data of a low Reynolds number to the higher Reynolds number flight regime. The objective is to identify the data trends over a broad range of Reynolds numbers so that the errors in applying low Reynolds number data to flight conditions can be eliminated. Included are studies of flow separation location and

drag changes with Reynolds number. This program's payoff to the Air Force will be in greater efficiency of aircraft testing due to increased reliability of wind tunnel data, thus reducing the need of flight test data and, consequently, reducing the cost and time necessary for present testing procedures.

Tests shall be conducted on an axisymmetric body of revolution to determine the effect of large changes in Reynolds number on boattail drag, separation location and pressure distributions. Several boattail configurations will be tested.

Supporting agency address information: Aerospace Research Laboratory LH, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0049, DIGITAL DISPLAY SWITCHING FOR HESS

K. WOODRUFF, Systems Research Labs. Inc., *Dayton, Ohio* 45432 (F33615-74-C-4054)

Development and demonstration of human engineering design features and procedures which will permit effective transfer of flight information between digital displays and crew members. This work unit is funded under the digital avionics information system (DAIS) advanced development plan (ADP) which includes the development of a 'hot bench' to serve as a test vehicle supportive of a functional systems approach to avionics information systems development. The overall DAIS ADP objective is to minimize proliferation and nonstandardization of aircraft avionics. This work unit relates to design of the man-machine interface in the DAIS 'hot behch'. The DAIS ADP is a joint coordinated effort of Air Force Avionics Laboratory, Air Force Flight Dynamics Laboratory, Air Force Human Resources Laboratory, Air Force Armament Laboratory, Electronics Systems Division, Aeronautical Systems Division, and The Aerospace Medical Research Laboratory.

A dedicated DAIS cockpit will be constructed as an integral part of the AMRL Human Engineering Systems Simulator (HESS). This will provide an unique capability for evaluating information transfer, display format, and display switching on an efficient, cost-effective basis. Part task and mission segment simulations will be used for experiments to compare the effectiveness of different mixes of shared and dedicated information and display switching techniques. Indices of effectiveness will include operator response times, simulated flying performance and workload measures being developed under AMRL Work Unit 71840946. The real-time man-in-the-loop simulations will be supplemented by models of overall man-machine performance to obtain estimates of the impact of design alternatives on the probability of mission success.

Supporting agency address information: 6570 Aerospace Medical Rsch. Lab HE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0050, HIGH DATA RATE LINK ANALYZER

J.E. ADAIR, U.S. Air Force, Avionics Laboratory, *Dayton, Ohio* 45433

To develop and refine those components necessary for the development of microwave receivers w/ultrawide bandwidths (up to 10 percent) in the 10 to 60 GHz frequency range. A further objective of this task will be to investigate both direct and indirect modulation techniques for high data rates to determine the most applicable technique for quadriphase modulation.

Initial efforts will be concentrated in the 35 GHz frequency domain with a goal of achieving a 3 GHz bandwidth. Areas of investigation will include the design of wide band mixer mounts, investigation of possible propagation delays in relation to modulation techniques. It is anticipated that an active link between AFAL and Trebein Facility will be set up to study some of these problems besides lab work on receiver design.

Supporting agency address information: AF Avionics Laboratory TEM, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0051, ACTIVE ELECTRO-OPTICAL SENSOR EVALUATION AND MEASUREMENT

F.P. BLOMMEL, U.S. Air Force, Avionics Laboratory, *Dayton, Ohio* 45433

To evaluate contractor components used in cueing sensors such as lasers and detectors and to fabricate specialized components such as a millimeter sensor scanner, and to supply the flight test support at WPAFB and TDY locations to support the FLIR/ ACTV Flight Test Evaluation Program being conducted under WU 20040223. Under that program, a series of judiciously planned flight tests of a FLIR and an ACTV will be conducted on a comparative basis to quantify the effects that various constituents of the operating environment have on sensor performance. The data will be used to update analytic models to provide a means of accurately predicting the operational capabilities of E-O imaging sensors.

A Honeywell 100 Watt Airborne CO2 Laser and a United Aircraft 3 watt local oscillator have already been evaluated. A laser frequency tracking loop is being designed and built for a heterodyne experiment to be conducted at ERIM using a Honeywell HGCDTE detector array. A 12 inch millimeter sensor scanner has been fabricated by the local shops using AFAL/SRL design and is now being balanced prior to delivery to ERIM. The evaluation of a Hughes Waveguide CO2 Laser is planned for the near future. The 4950th flight test office will be responsible for furnishing the Testbed Aircraft, performing A/C modifications, installing equipment and instrumentation. They will also supply a testbed director, maintenance personnel, flight crews and sensor operators. Flight test organizations at TDY bases will be tasked to supply transient maintenance, hangar space, office space, ground support, radar tracking, TSPI data reduction and weather data.

Supporting agency address information: AF Avionics Laboratory RSP, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0052, PRELIMINARY DESIGN OF THE LEADING AND TRAILING EDGE SYSTEM FOR A VARIABLE CAMBER WING

J.E. MALINAK, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433

The variable camber wing concept possesses a very high potential for increasing the efficiency and performance of Air Force flight vehicles through the attainment of increased aerodynamic performance and reduced structural complexity over a complex slat/flap system. The structural/mechanical design of the flexible skin leading and trailing edges presents a crucial problem to be solved before this concept is incorporated into Air Force aircraft. It is the objective of this in- house effort to design a variable camber leading and trailing edge system. Additionally, an operable model will be constructed to demonstrate the concept.

Using available data from other Air Force programs investigating the variable camber wing concept, several leading and trailing edge designs will be developed which will be directed toward high reliability, low cost and low weight. An optimum design will be completed and compared to designs of the contracted efforts. A three dimensional model will be fabricated to demonstrate the properties of the design.

Supporting agency address information: AF Flight Dynamics Laboratory FBR, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0053, MICROELECTRONIC DES/FAB

G.D. MALLALEY, U.S. Air Force, Avionics Laboratory, *Dayton, Ohio* 45433

To use hybrid microcircuits built in an IH facility. Modules built in such a manner help to bridge the gap between what is available from vendors and what is possible by making full use of the technology. To be effective at hybrid designs for use in such a facility and for evaluation of contractual proposals requires an intimate knowledge of integrated circuit technology. The AF benefits from the equipment designs that can be made to incorporate many more state of the art devices than otherwise possible.

To build specific IH hybrid needs until competency in hybrid fabrication has been achieved. These will include unique digital and linear circuits, memories, functional ALU type circuits, and detectors. When competency is acquired, such systems as radar processors, detectors and transmitters, data processing units and communication subsystems will be built for future AF systems.

Supporting agency address information: AF Avionics Laboratory TEA, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0054, TRANSFERRED ELECTRON DEVICES
G.L. MCCOY, U.S. Air Force, Avionics Laboratory, *Dayton, Ohio* 45433

Because of the significant impact offered by this device in the area of high speed processing, it is advantageous to concurrently establish this IH effort to support contractual efforts by studying the critical problem areas associated with GAAS material and processing parameters associated with the development of TEDS. The objective of this task will be to refine the design criteria for high speed transferred electron device (TED) switches, and to investigate novel designs and fabrication techniques.

The design criteria presently used for fabricating TED high speed switches are based on relatively crude theoretic treatments, this theory will be refined and modified where necessary to derive improved design criteria. The validity of these criteria will then be proven or disproven experimentally. Unique multi-terminal devices will then be fabricated and tested based on the improved design.

Supporting agency address information: AF Avionics Laboratory TEM, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0055, AUTOMATED DESIGN OF ADVANCED AEROSPACE STRUCTURES
V.B. VENKAYYA, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433

The severe demands on the strength requirements of the modern aerospace vehicles require optimization procedures to reduce the growing weight of these vehicles. The general objective of this effort is to develop necessary tools for integrated design of advanced aerospace structures. The specific objective is to develop methods and build capability for minimum weight design of structures with strength and stiffness requirements under subsonic and supersonic flight conditions and impulse loads such as aerodynamic gust and impact due to aircraft landing. Economy, reliability, and reduced design time are the major benefits expected from this effort.

Under the two completed work units (JON 14670111 and 14670112) optimality criteria methods were developed for minimum weight design of structures. These methods will be further developed for use in practical design conditions. Mathematical programming methods will be coupled with optimality criteria methods to handle complex design situations. These methods will be coded into computer programs to achieve the design objectives.

Supporting agency address information: AF Flight Dynamics Laboratory FBR, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0056, CONTROL OF GROUND TEST FACILITIES FOR HIGH SPEED FLIGHT SIMULATION
W.C. WELLS, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433

High speed flight vehicles are subjected to severe conditions during re-entry into earth's atmosphere. These re-entry conditions can be simulated in ground test facilities. Ground test facilities for aerodynamic and thermodynamic simulation of high speed flight conditions are subject to continually changing requirements. The objective of this work unit is to identify and alleviate technical deficiencies and improve system reliability and maintainability in the AFFDL ground test facilities. Technology, techniques and equipment will be developed for system automation, environmental protection, and structural and mechanical integrity. Improvement of ground test facilities makes possible their use in overcoming a broad spectrum of technical difficulties associated with high speed flight.

The cost effectiveness of current high pressure air, water, vacuum and refrigeration systems operation will be weighed against the effects of system automation or replacement. Systems will be automated or improved as required. The operating effectiveness, environmental effects and integrity of mechanical and structural systems will be studied and unsatisfactory conditions alleviated.

Supporting agency address information: AF Flight Dynamics Laboratory FXN, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0057, TRANSPIRATION COOLED NOSE TIPS ON REENTRY VEHICLES
K.E. YELMGREN, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433

Advanced ballistic reentry vehicles will require transpiration cooled nose tips. The objective of this work is to optimize the shape of the nose tip for minimum aerodynamic heating to the reentry vehicle. This will result in a reduction of the amount of coolant required and thus improve the performance of the reentry vehicle.

An analytical study will be carried out first. This phase will identify the basic shape of the nose tip and its dimensions. An experimental investigation will then be conducted in the AFFDL rent facility to verify the results of the analytical study.

Supporting agency address information: AF Flight Dynamics Laboratory FX, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0058, HELICOPTER TRANSMISSION VIBRATION AND NOISE REDUCTION PROGRAM
R. HARTMEN, Boeing Company, *Philadelphia, Pennsylvania* 19142 (DAAJ02-74-C-0040)

To generate clear, concise and usable, analytical tools that would, during the design stage of a program, allow the design team the capability to perform trade studies that would yield drive train components that are dynamically quiet, with inherently longerlife and reduced vibration and attendant noise levels.

(1) construct analytical prediction technique and predict vibration/noise levels of baseline transmission- (2) refine analysis/design and fabricate components to reduce vibration/noise levels of baseline transmission- (3) test modified transmission- (4) compare results and conduct users conference.

Supporting agency address information: AVCOM Eustis Directorate, Ft. Eustis, Va. 23604

SUPPORTED BY U.S. Dept. of Defense - Army

4.0059, METASTABLE METALLIC SUPERCONDUCTORS WITH HIGH TRANSITION TEMPERATURES
D.W. DEIS, Westinghouse Electric Corp., *Pittsburgh, Pennsylvania* 15235 (F44620-74-C-0042)

High temperature superconducting materials are needed for application in airborne multimegawatt power generation and conditioning systems. Research specifically directed toward the synthesis and characterization of high transition temperature metallic compounds can provide a greater margin of design efficiency and operational reliability than presently available superconductors. The performance of high field magnets and solenoids, electric motor windings, superconducting rotors in power generators, transformers and induction energy storage systems could be significantly improved if the upper critical field, the current-carrying capacity and the critical transition temperature of the superconducting material could be enhanced. In addition, AC power distribution losses, transients and mechanical breakdown of the superconductor need to be reduced. This research involves the preparation of high transition temperature (above 20 degrees K) metastable metallic alloys and compounds using the low energy sputtering technique or other novel methods. The physical, chemical, metallurgical and structural properties of these materials are being measured and correlated. Methods for the processing and fabrication of these a-15 beta-tungsten structures into technologically useful configurations are being considered for device concepts and aerospace applications.

Supporting agency address information: AF Office of Scientific Research NE, 1400 Wilson Blvd, Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0060, APPLICABILITY OF FRACTURE MECHANICS TO AIRCRAFT ENGINE DISC LCF LIFE
P. PACKMAN, Vanderbilt University, School of Engineering, *Nashville, Tennessee* 37203 (AF-AFOSR-2737-74)

Currently, aircraft engine fatigue/fracture life cycle prediction techniques are in a state of development requiring very conservative primitive application to the AF operational equipment. Because of the conservatism of the design process, the vast majority of the turbomachinery components pulled out of AF operational inventory have only reached some small fraction of the actual life and have some potentially significant useful life remaining. It is the objective of this proposal to investigate those fundamental properties of materials associated with the fracture mechanics concepts as a useful and reliable portion of the disc life design process. This investigation will consist of three interrelated phases. 1) a study of the viscoelastic crack tip displacement changes that occur as a function of stress, time, and temperature. 2) a fracture mechanics study of the interactive processes of creep-fatigue subcritical crack growth and the influence of peak overstresses at elevated temperatures on the subsequent crack growth at lower temperatures and stresses. 3) an analysis of the cycle counting process and the cumulative damage occurring in the disc components with emphasis on obtaining a characteristic frequency that models the forcing function (the engine input spectra) in terms of the process function (the material damage response) by a dynamic impulse testing technique.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd, Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0061, APPLICATION OF HOLOGRAPHY TO STRUCTURAL ANALYSIS
C.A. WALKER, Univ. of Strathclyde, *Glasgow, Scotland, United Kingdom* (AF-AFOSR-2566-73)

AF function - design of reliable, efficient aircraft structures. Deficiency - current structural inspection/analysis techniques are not capable of determining the load history of a structural member. Research - develop and demonstrate a laser holography method of recording strain history records for large, complex airframe components. How research contributes - this research will contribute directly to the solution of the problem of aircraft structural life monitoring/determination. Strain history records taken at various time intervals during the projected airframe lifetime can be compared to determine accumulated damage. Also provides valuable structural test strain measurement device.

Investigator will use conventional laser holographic techniques in conjunction with image recording methods to demonstrate the feasibility of recording strain at various stress levels and time intervals. Correlation of results will be accomplished.

Supporting agency address information: European OFC of Aerospace Rsch. and Dvlpmt. NRE FPO, New York 09510

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0062, JOINT NASA/TSC/FAA ATS-F TEST PLAN
UNKNOWN, Boeing Company, *Seattle, Washington* 98108 (048592 (TRAIS NO.))

The objectives of this satellite experimentation program are embodies in the joint NASA/TSC/FAA ATS-F Test Plan. A copy of the ATS-F Test Plan will be furnished to the Contractor. This document will serve as the primary guide for the Test Support Contractor. The time period for performing the ATS-F test correspond to the initial availability of the ATS-F satellite scheduled for May, 1974 to April, 1975. It is planned that all test equipment be completed, tested, and accepted by the Government at the Contractor's plant to coincide with this schedule.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

4.0063, TURBULENCE AND SHEAR LAYERS IN HIGH ENERGY LASERS
D.A. RUSSELL, Univ. of Washington, School of Engineering, *Seattle, Washington* 98105 (AF-AFOSR-2512-73)

The AF high intensity radiation program is beset by a number of difficult fluid mechanical problems, the solution of which can make the difference between poor to mediocre and good success of the program. This effort addresses some of the most urgent of these problems. The work pertains to determining the level of turbulence in gas laser cavity resonators and relating the radiation quality degradation to said turbulence to determine tolerable turbulence levels. Also, means of reducing turbulence to tolerable levels will be investigated. Further, reactant mixing in turbulent shear layers will be investigated with a view to achieving optimum reaction rates at tolerable turbulence levels. Another aspect of the work will address the small scale supersonic diffuser problem as it now confronts flowing gas laser efforts elsewhere. The current year's effort will be comprised of an experimental study of mixing layers, gross characterization of mixing layer turbulence through optical means, and an analytical study of supersonic staged gasdynamic laser systems.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd, Arlington, Va. 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production And Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, STUDIES OF HIGH LATITUDE STRATOSPHERIC AEROSOLS BY PHOTOMETRY OF THE TWILIGHT SKY
G.E. SHAW, Univ. of Alaska, Geophysical Institute, *Fairbanks, Alaska* 99701

Aerosols in the stratosphere will be investigated from a high latitude (65 degrees N) location in Central Alaska. Multispectral measurements of sky radiance will be made during twilight for clear sky conditions. Data will be analyzed using optical scattering models and mathematical inversion methods will be developed and extended. It is hoped that data will be developed on baseline concentration of aerosols in the stratosphere following the decay of the Agung eruption dust layers.

SUPPORTED BY U.S. Natl. Science Foundation

5.0002, MULTIBAND SPECTRAL RECONNAISSANCE FOR FORESTRY
R.N. COLWELL, Univ. of California, Agricultural Experiment Sta., *Berkeley, California* 94720 (CA-F0-FRU-2180-MS)

OBJECTIVE: Purpose of the research includes determination of the accuracy and ease with which various forest characteristics can be identified and/or measured by various remotely-situated electro-magnetic sensors; the applicability of infra-red, ultra-violet and radar imagery to collection of forest fire and hydrologic information; and the techniques needed for effective application of these devices to various problems of forest, range, and wildland reconnaissance.

APPROACH: Test areas will be selected and accurately mapped in order to locate all physical features to be studied; simultaneous multi- band spectral reconnaissance for each test area will be obtained; on the basis of ground evaluation of this reconnaissance, specifications and keys will be developed to define operationally effective uses of the technique.

PROGRESS: Multiband photos of our Forestry test sites in California were obtained by the unmanned satellite, ERTS-1, from an orbital altitude of 570 miles. The imaging system was used as a multispectral scanner which recorded scene brightness data from the green, red and near-infrared bands. These black-and-white multiband photos were interpreted (a) individually, (b) after being optically combined to form simulated infrared ektachrome color composites and (c) after being electronically combined with a closed circuit color television system to form various 'false-color' composites. Interpretation was made of the total resource complex (including timber, forage, soils, rocks, snow and water) within several selected areas of the NASA test site. Results thus obtained were compared (in terms of accuracy, cost and time requirements) with results obtained from conventional and 'high flight' (U-2) photography that had been obtained

of the same areas. It was concluded that, as compared with previously used techniques, broad reconnaissance surveys can be made with acceptable accuracy and with significantly less cost and time, using ERTS-1 multiband photos which have been optically or electronically enhanced.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0003, ACTIVE AND PASSIVE PROBING OF THE MAGNETOSPHERE USING VLF TECHNIQUES AT SIPLE STATION, ANTARCTICA

R.A. HELLIWELL, Stanford University, School of Engineering, *Palo Alto, California* 94305

The continuing approach for the second year of the multi-year grant remains unchanged; for this reason a copy of the Project Summary for the initial year is included. Specific additions to the correlative program will be to compare the autoral photometer output with the on-off period of the transmitter to detect the effect of the transmitter signals on aurora production. The magnetometer, magnetic pulsation detector, and the riometer will provide information on the properties of the ionosphere and magnetosphere which may be modified by the injected waves. It is pointed out that, as a result of the unique importance of wave injection (via the longwide antenna) to all controlled wave- particle interactions, the transmitter and the receivers delineated above form an integral part of the International Magnetospheric Study (IMS) program which will begin during the effective life of this grant. A study will be made of the probable worth of lengthening the present antenna and/or adding a parallel strand and of adding a remote station between 50 and 200 km geomagnetically north of Siple. The remote station would be used to study transmitter echoes and to monitor natural events.

Three to six Stanford people will be on station during the austral summer and two people will winter.

Careful housekeeping and waste heat distribution in the living quarters and management of outside storage have retarded station deformation and snow accumulation to the point the lifetime of Siple I is now estimated to extend at least through austral winter 1977, well beyond the termination date of the 2nd year renewal of this grant.

SUPPORTED BY U.S. Natl. Science Foundation

5.0004, REMOTE SENSING OF OCEAN PROPERTIES VIA VISIBLE LIGHT

S.Q. DUNTLEY, Univ. of California, Graduate School, *San Diego, California* 92038 (04-3-158-64 MOD 1)

Objective: To determine relationships between sub-surface ocean properties (suspension of minerals and plankton) and the spectral brightness of the ocean in scattered sunlight as observed from aircraft and spacecraft. In particular, the effects of the components reflected from the surface (and its dependence on sea state) and the effects of the intervening atmosphere need quantitative evaluation for an instrument observing from space.

Approach: Fabrication and modification of measurements, instruments, and software programs for data analysis and display methods are underway. Plans to assist NOAA and NASA to acquire remote sensor data from an airborne Scanning Imaging Spectroradiometer (SIS) with concurrent in situ data will be executed. The distribution of radiance from the ocean surface for various zenith angles and atmospheric conditions will be analyzed and predicted using data from aircraft and in situ sensors and software programs already developed. Processing of radiometric data to enhance the display of ocean-color-related features will be extracted from computer compatible tapes supplied by NASA and NOAA.

Progress: The contractor has developed the capability to produce, using computer techniques, the spatial distribution of the apparent radiance of the ocean surface if water constituents, distribution of sky radiance above the water, surface wind speed, and optical properties of the atmosphere are known. Fabrication of specialized instruments for measuring the optical environment have been made by the contractor including software programs for data processing and display.

SUPPORTED BY U.S. Dept of Commerce - N.O.A.A.

5.0005, EQUATORIAL F REGION

F.S. MOZER, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302

Project objective: To merge the new understanding of equatorial spread F obtained by the in situ observations and theoretical calculations of the Berkeley group with past work of NOAA to better understand the conditions and regions in the ionosphere where spread F occurs.

Current year plan: Merge the in situ experimental spread F data obtained during the flight of two sounding rockets with ground-based backscatter measurements by NOAA and with the theoretical calculations made by one of the co-investigators, in an effort to identify the instability or instabilities operating in the F region during equatorial spread F conditions.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0006, MAGNETOSPHERIC STUDY

UNKNOWN, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302

Project objective: Programming for the International Magnetospheric Study.

Current year plan: Continued assistance on display techniques for data from the HELIOS Mother-Daughter experiments.

Progress report: Lorne Matheson is currently working with personnel of Max-Planck Institute at Lindau where he is expected to remain until August, 1974. The primary work has involved coordination of data formats for the Mother-Daughter data tapes. He is actively engaged in planning on an effective division of computer processing efforts to make the maximum use of the computer facilities here and at Max-Planck.

SUPPORTED BY Max Planck Inst. For Phys. - Munich

5.0007, ATMOSPHERIC MOTION COMPARISON

J.W. WRIGHT, U.S. Dept. of Commerce, Environ. Research Laboratories, *Boulder, Colorado* 80302 (RDJ48024)

Project objective: The project provides support explicitly and exclusively for collaboration between members of the CNET (France) an NOAA (Boulder) in a NATO-approved joint research effort concerned with comparing several ground-based methods of measuring motions in the ionosphere.

Current year plan: Undertake data processing computations which convert data available in one format to another useable by the collaborating groups. Support travel necessary for collaborative authorship and/or research activities with reduced data already acquired.

Progress report: Results obtained from analysis of the 1970 measurements continue to provoke new questions and to stimulate research leading to results which merit publication before completing presentation and interpretation of the kinesonde/meteor comparisons. Three publications have been accepted of this kind. Three others are in preparation: (a) French study of 'random' velocities from meteor data; (b) NOAA study of statistical meaning of kinesonde random velocities; (c) intercomparison of meteor/kinesonde wind velocities. A manuscript on these results is nearing completion.

SUPPORTED BY North Atl. Treaty Org. - Brussels, Belg.

5.0008, LOCALIZED ENVIRONMENTAL INVENTORIES FOR NATURAL RESOURCE MANAGEMENT PLANNING

W.E. FRAYER, Colorado State University, Agricultural Experiment Sta., *Fort Collins, Colorado* 80521 (COL00336)

Objective: Develop and apply methods of obtaining information needed for preparation and updating of resource management work plans. Because the Colorado State Forest Service is to be the cooperating agency, 'resource management' is intended as the management of several resources (including human resources) within local areas on which some forest vegetation is present. Included are areas such as mountain subdevelopment, but not urban areas.

Approach: Sampling designs, measurement techniques and analysis procedures will have to be developed for each attribute to be inventoried. Techniques developed will be tested in at least

one Colorado country with the field work supervised and conducted by the Colorado State Forest Service. Aerial photos and ground visitations will be used to provide double sampling.

Progress: Quantitative and qualitative data for land resources in one township near Boulder, Colorado have been collected and placed in a data bank. Data include location characteristics, topography (slope, elevation, aspect), development status, and forest fire fuel categories. Data bank entries are presently being checked for consistency. Computer programs will be developed for extracting and compiling these data in the form of tabular summaries and/or computer-produced maps according to a variety of options. Results will then be reviewed to determine usefulness to agencies and individuals such as the Colorado State Forest Service and county planners.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0009, ATMOSPHERIC RELATIONS OF NO3

H.M. POLAND, Colorado State University, School of Science, *Fort Collins, Colorado* 80521

Laboratory studies of atmospheric reactions involving NO3 will be carried out in order to establish reaction products and mechanisms. Neither the products nor the quantum yield of the photodissociation of NO3 have been studied so far. Since NO3 has absorption bands throughout the visible region of the spectrum, the yield of photodissociation is important for the determination of the total concentration of NO3 in the stratosphere and troposphere.

SUPPORTED BY U.S. Natl. Science Foundation

5.0010, AIRCRAFT/AIRPORT STUDY - LEGAL ANALYSIS

L.H. MAYO, George Washington University, Prog. of Pol. Stud. Sci. Tech., *Washington, District of Columbia* 20037 (72P21046)

This study project will undertake to provide the legal- institutional analysis required for the implementation of EPA's responsibilities pursuant to Section 7 of the Noise Control Act of 1972 (Aircraft Noise Standards). The approach proposed is to identify the 'noise control' choices available at critical decision points in the developmental process of airport-aircraft planning, implementation and operations. The study will further undertake to examine the aircraft noise prevention or abatement strategies available at each such decision point, the availability or unavailability of legal-institutional instruments to implement such strategies, the extent to which existing authority has been effectively applied to noise abatement programs, the more serious deficiencies in existing authority (or other constraints) which have precluded effective noise abatement at the Federal, State and local levels, and recommendations for the modification or enlargement of existing authority so as to abate aircraft noise intrusions to a level consistent with the 'public health and welfare.'

SUPPORTED BY U.S. Environ. Protect. Agency - O.R.M.

5.0011, TRANSFER PROCESSES AND TRACE CONSTITUENTS IN THE STRATOSPHERE

R.J. ENGLEMEN, U.S. Energy Res. & Dev. Admin., *Washington, District of Columbia* 20545 (036847 (TRAIS NO.))

No summary has been provided to the Smithsonian Science Information Exchange.

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SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

5.0012, MEASURE STRATOSPHERIC CONSTITUENTS FOR CIAP (LIDAR MEASUREMENTS)

L. POPPOFF, U.S. Natl. Aero. & Space Adm., Headquarters, *Washington, District of Columbia* 20546 (036848 (TRAIS NO.))

Determine concentration, vertical distribution and variability of stratospheric constituents. Reduce, analyze and interpret data to determine average ambient conditions during the 18-month study period. Report findings in accordance with Section D Reporting. Management of the above work shall be accomplished by NASA-Ames under Dr. Leo Poppoff as manager currently monitoring related contracts in this area.

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SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

5.0013, INVENTORYING AND MONITORING OF EARTH RESOURCES BY REMOTE SENSING

M.F. BAUMGARDNER, Purdue University, Agricultural Experiment Sta., *Lafayette, Indiana* 47907 (IND01409)

Objective: Study the relationships between the multispectral radiation characteristics of soils and the physical and chemical properties of soils. Study the relationships between the radiation characteristics of vegetation and the properties of the soils on which the vegetation is growing. Conduct research on the application of remote sensing for determining land use, soil delineations, and vegetation mapping.

Approach: Multispectral scanner data obtained from aircraft and spacecraft platforms, aerial multispectral photography, and ground observation data will be used in the preparation of earth resources inventories. Both supervised and non-supervised programs will be used in the computer-implemented analysis of multispectral data. Ground observation data will be used as training sets for computer-implemented analysis and for testing analysis results. These techniques will be used in the preparation of land use inventories, soil surveys, and vegetation maps. Sequential data (multispectral scanner passes over the same site on different dates) will be used to detect and monitor changes.

Progress: Significant progress has been made in the application of computer-implemented pattern recognition techniques in the analysis of multispectral scanner data obtained by multiple passes of the Earth Resources Technology Satellite (ERTS) over a wide geographical range. These techniques have been used to prepare soil association maps, identify, map, and measure acreages of crops; study the conditions of rangelands; prepare land use inventories of both rural and urban lands; monitor the sediments entering reservoirs from different small watersheds; and map and monitor the change in aerial extent of bodies of surface water in the Southern Great Plains. These techniques were applied to studies of satellite data obtained over Mali and Sudan in sub-Saharan Africa. It was shown that ERTS provides a common source of data from which geology, soils, vegetation, surface hydrology, and land use maps can be produced by machine processing of multispectral scanner data. This capability provides a valuable new tool for preparing resource inventories of much of the developing world. A new computer program developed at the Laboratory for Applications of Remote Sensing provides a map from ERTS data which is geometrically correct and can be overlaid with other maps.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0014, BIOPHYSICAL RESEARCH IN REMOTE SENSING

R.M. HOFFER, Purdue University, Agricultural Experiment Sta., *Lafayette, Indiana* 47907 (IND01658)

Objective: Determine the capability to identify and map various forest and agricultural features, through the utilization of remote multispectral sensing and automatic data processing techniques. Relate spectral response patterns to the physical and chemical properties of the vegetation and soils studied.

Approach: Obtain photographic and multispectral scanner data at specific intervals throughout the growing season. Ground truth information concerning type and condition of surficial ground cover will be obtained. Utilize data processing capabilities developed by the Laboratory for Agricultural Remote sensing to study spectral characteristics of major crop and forest species, soil type, and moisture conditions. Define materials which can and cannot be spectrally distinguished at each period during the growing season. Define wavelength bands of particular utility. Automatically map entire flight lines of data, utilizing training samples. Assess automatic mapping results through the use of ground truth data and aerial photos.

Progress: Analysis techniques useful for processing Earth Resources Technology Satellite (ERTS-1) data to meet geologic, forestry, land use, and water resource applications objectives have been developed and tested. Geometric correction and scaling techniques, and computer- enhanced color enlargements of ERTS data are of particular significance. Classifications and acreage determinations have provided accurate estimates of forest

cover, crop acreage, current land use, and various water resource situations. The results have proven the value of these computer-aided analysis techniques, even for data from areas of mountainous terrain. Studies involving 12 wavelength bands of multispectral scanner data show the value of the various spectral regions for forest type mapping. Thermal and middle infrared wavelengths were stressed. Results indicate that basic forest cover types can be classified with accuracies of over 90% using these computer-aided pattern recognition analysis techniques.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0015, KINETICS STUDY OF CHEMICAL REACTIONS IN THE STRATOSPHERE
D.D. DAVIS, Univ. of Maryland, School of Arts, *College Park, Maryland* 20740 (038696 (TRAIS NO.))

The specific aim is to measure the rates of significant chemical reactions, both before and after perturbation of the stratosphere by aircraft exhaust. These measurements are being performed in the laboratory, in such a way that the resulting rate constants can be applied to stratospheric ranges of temperature, pressure, and species concentration. To achieve this, detection techniques are being improved for hydroxyl, hydroperoxyl, and singlet-D oxygen. As of 7-73, about 15 reactions have been measured.

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SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

5.0016, NATURALLY AND ARTIFICIALLY INDUCED ELECTRON PRECIPITATION NEAR THE PLASMAPAUSE
T.J. ROSENBERG, Univ. of Maryland, School of Engineering, *College Park, Maryland* 20740

The present proposal is for the second year of a three-year continuing grant. Inasmuch as the general plan and purpose of the research is unchanged, the original summary sheet for the initial year is attached. There are specific plans to mount a large 10 balloon expedition in the northern hemisphere; all of the balloons will carry particle counters, and five will carry VLF receivers. The flight will be made in the north to take advantage of the highly effective triggering of VLF emissions in the northern hemisphere by the 21 km antenna in the southern hemisphere (at Siple). Another instrument, a goniometer, will be incorporated into the northern instruments to provide information on the location of the ionospheric end points of emission ducts.

SUPPORTED BY U.S. Natl. Science Foundation

5.0017, PRECISION PHOTOGRAMMETRIC TRIANGULATION
B. CHOVITZ, U.S. Dept. of Commerce, Geodetic Res. & Dev. Lab., *Rockville, Maryland* 20852

The precise determination of the spatial positions of premarked points on the surface of the Earth from aerial photographs, replacing or at least supporting the classic method of lower-order geodetic triangulation.

Technical objective is to study the feasibility of using a precalibrated and reseau-containing aerial camera of highest precision for obtaining aerial photography with at least 66% fore- and side-lap, in order to determine the spatial positions of premarked points (by methods of analytical aerial triangulation) making use of an optimal combination between lens filter and reflectance characteristics of the point markers. The goal is to develop a method more economical than classic geodetic triangulation for determining lower-order triangulation points with accuracies compatible with engineering requirements.

The program requires the procurement of a high precision, wide- angle reseau aerial camera. The extensive experience available from the execution of the geometric satellite triangulation program will be used for determining the optimum camera calibration procedure, including a study on the feasibility of using artificial star fields. Available experience in designing sparse matrix inversion routines will be applied to the data reduction phase. Actual tests will be conducted in areas now being surveyed by classic methods.

Work plan--procurement of camera. Calibration of camera with natural and artificial star field as well as with McClure Test Area photography. Development of optimized analytical data reduction program. Full-scale test over an area presently being supplemented with lower-order geodetic control by classic triangulation methods.

The high-precision camera lens cone was contracted to Wild-Heerbrugg and is scheduled for delivery in August 1974. Tests will be initiated soon thereafter.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0018, SPECIAL PROPAGATION RESEARCH
J. BUCHAU, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - communications via and through arctic and other disturbed ionospheres and OTHD. Deficiency - incomplete understanding of disturbed ionosphere and its effects on communications, navigation and OTHD. Research - arctic propagation experiments conducted by Airborne Ionospheric Laboratory and the Goose Bay Ionospheric Observatory (GIO). Study effects of the ionosphere on radiowave propagation in terms of auroral absorption, mode availability, Doppler spread. Verification of Li arctic model ionosphere. Application to OTH systems. Development of the GIO into an auroral oval monitor station. Airborne vhf scintillation studies in support of afsatcom requirements in arctic and tropic regions. How research contributes - provides inputs for design/operation of command, control and OTHD systems. Flight program jointly with OTH experimental radars studies ionospheric effects on OTH systems. Comparison of DMSP auroral pictures with GIO and airborne simultaneous ionograms and study of auroral backscatter will enhance AWS prediction specification and real time monitor capability.

Supporting agency address information: AF Cambridge Research Laboratories LI, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0019, INVESTIGATION OF THE ARCTIC IONOSPHERE
A.A. KOCHIS, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - ionospheric effects on propagation. Deficiency - inadequate knowledge of the arctic ionosphere with particle-energy injection, magnetic control-trapping. Research - specification of the arctic ionosphere in quiet and disturbed states. How research contributes - inputs to modeling of weapons effects, this effort provides for the maintenance and updating of a research system including airborne and ground equipment for investigating anomalous ionospheric behavior in an attempt to understand the arctic ionosphere so that nuclear weapons effects can be detected and predicted.

Supporting agency address information: AF Cambridge Research Laboratories LI, Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0020, DETERMINE THE ATMOSPHERIC TRANSPORT PROCESS IN THE 12 TO 25 KM ALTITUDE REGION
ROSENBERG, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* (036852 (TRAIS NO.))

Determine the atmospheric transport process in the 12 to 25 km altitude region using: Smoke forming canisters released from balloons at WSMR, photographs of smoke trails taken with AFCRL high relolution cameras and telescopic cameras, temperature profiles telemetered by temperature probes aboard canisters. Conduct experiments four times at two successive noon-twilight periods. Field trips include WSMR in Dec.1972, WSMR in April 1973 and Fort Churchill in Sept. 1973 to investigate seasonal and latitude differences in major SST air corridors. Quarterly, semi-annual and final reports.

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SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

5.0021, ENERGY INPUT AND OUTPUT
S.M. SILVERMAN, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - polar communications, early warning and detection systems. Deficiency - sporadic effects and inhomogeneities due to particle precipitation interfere with communications and warning and detection systems. Research - determine the energy balance of the polar cap with particular reference to the particle flux and energy spectra and the forms in which degradation of the input energy takes place, such as optical emissions and ionization. How research contributes - measures state of polar cap atmosphere and effects of particle precipitation so that interference with communications and warning and detection systems may be better defined. The objectives - evaluation of existing published data and the analysis of data being collected at AFCRL Geopole Observatory, evaluation of optical and other techniques in terms of the information that can be extracted about energy input and output, design of new experiments to fill gaps in existing information and installation of routine monitoring equipment at Geopole Observatory.

Supporting agency address information: AF Cambridge Research Laboratories PH, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0022, CHEMICAL RELEASE STUDIES AT RADAR BLACKOUT ALTITUDES
W.K. VICKERY, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - detection, discrimination, track and intercept radio communications. Orbital and re-entry prediction. Deficiency - transmission of radio waves for communication and radar track and orbits of satellites cannot be reliably predicted following nuclear detonation or solar flares. Aircraft are vulnerable to IR missiles. Research - study of chemicals released into upper atmosphere and their optical and radio frequency effects and chemical releases as IR decoys. How research contributes - studies of chemical releases provide data on the dynamics and structures of the neutral atmosphere and ionized irregularities which contribute to the following areas. Prediction of satellite orbits requires atmospheric models which include effects of atmospheric transport processes and dynamics in normal and disturbed conditions. Reliable operation of early warning radar requires data on spatial and time variations of regions disturbed by nuclear and missile effects. Reliable operation of ABM radar requires understanding of effects of natural and artificial ionospheric irregularities on radar transmissions. Chemical releases show strong potential to IR decoys for aircraft protection against air-launched heat seeking missiles.

Supporting agency address information: AF Cambridge Research Laboratories LK, Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0023, AIRCRAFT/AIRPORT OPERATIONS NOISE STUDY
W.J. GALLOWAY, Bolt Beranek & Newman Inc., *Cambridge, Massachusetts* 02138 (72P21047)

Objective: To investigate the effect of various aircraft operational procedures on community noise exposure. Approach: Task 1 - Utilize a computer simulation to assess the relative merits for noise control for various takeoff and approach procedures for jet transport aircraft. Task 2 - Perform a series of noise measurements before and after a change in nighttime flight operations at Los Angeles International Airport to assess the impact of the change. Task 3 - Perform a series of noise measurements at San Jose Municipal Airport to evaluate the effect on community noise of different operational procedures used by different airlines. Task 4 - Provide engineering and economic analyses to support for functioning of the EPA Aircraft/Airports Report Study Task Groups.

SUPPORTED BY U.S. Environ. Protect. Agency - O.R.M.

5.0024, DEVELOPMENT OF ATMOSPHERIC MODELS
L. JACCHIA, Smithsonian Institution, *Cambridge, Massachusetts* 02138

Atmospheric research using satellite-drag and composition data has been carried out at Smithsonian Astrophysical Observatory (SAO) since 1959. At this time, fundamental information concerning atmospheric structure, density, composition, and variations is being revealed. Instrumented satellites are now providing compositon data that will allow the development of accurate and complete models of the atmosphere and its variations.

The five activities planned for the total SAO FY-75 program of Upper Atmospheric Research are outlined below. The SRF grant will primarily be used for computations required for parts A and E, and will be coordinated with SAO's NASA program: A. Present temperature models are based on the 10.7-cm solar-flux index; new ones will be developed from an extreme-ultraviolet (EUV) index derived from data collected by the Atmospheric Explorer satellite (AE-C) and from satellite drag. B. Models for the departures of compositon from the static-diffusion model will be refined. These models will be able to represent variations in composition observed by mass spectrometers on the OGO-6, ESRO-4, and AE- C satellites, temperature variations observed through Doppler monitoring of the 6300 A airglow line on OGO-6, and density determinations from SAO drag data. C. The geomagnetic effect on composition will be determined by comparing number-density measurements from the ESRO-4 satellite with geomagnetic data. D. The rotation of the atmosphere will be deduced by observing the secular decreases in the orbital inclinations of seven satellities. The drag associated with a particular value of rotation is modeled very precisely since these satellites already have effective atmospheric densities determined as a function of time. This work will involve the analysis of satellite-orbit and density data already at SAO. E. The density determinations for FY 1970, 1971, and 1972 have been completed and will be published, while new ones will be made and published for FY 1973 and 1974. Emphasis will be given to the period when the AE-C satellite is making in situ measurements of the EUV flux to be used in correlative analyses.

SUPPORTED BY Smithsonian Institution

5.0025, EFFECTS OF MECHANIZED LOGGING IN NORTHERN MINNESOTA
B.A. BROWN, Univ. of Minnesota, Agricultural Experiment Sta., *St. Paul, Minnesota* 55101 (MIN-19-017)

Objective: Determine effects of mechanized harvesting on forest environmental factors and their compatibility with current silviculture, wildlife, watershed and recreation programs. Develop harvesting patterns in harmony with multiple use management.

Approach: Continue contacts to evaluate developments in eastern US and Canada for application to our conditions. Continue case studies of harvesting systems, equipment and operating conditions to evaluate their impact and compatibility. Establish objectively designed treatments to study factors affecting forest conditions, vis-a-vis, timber production, wildlife habitat, soil fertility, compaction, infiltration, and other forest uses. From analyses of above data identify important trends and establish pilot operations to test forest resources management requirements and provide economic information for administrative guide lines.

Progress: The major jobs of 1973 were: completed 2 studies testing use of remote sensing (aerial photos) as a method of evaluating environmental impact of mechanized harvesting and planning harvesting patterns, started studies in northern hardwood and spruce-fir forest types, conducted survey to determine change in status in use of mechanized harvesting since 1967, and worked with wildlife habitat researchers in setting up mechanized harvesting operation to improve ruffed grouse habitat. Reported results of studies in student lectures, field trips, and assisting foresters in preparing harvesting operations to test findings.

SUPPORTED BY Minnesota State Government - St. Paul

5.0026, ATMOSPHERIC INFLUENCES ON ECOSYSTEMS AND SATELLITE SENSING
A.C. MACE, Univ. of Minnesota, School of Forestry, *St. Paul, Minnesota* 55455 (MIN-19-035)

Objective: Develop methods for evaluation and utilization of remotely sensed data pertaining to agricultural ecosystems for ERTS and aircraft. Develop improved statistical relationships and analyses of solar radiation and certain other atmospheric varibles of fundamental impact on plant growth and yield.

Approach: Use remote sensing techniques to provide unlimited capabilities for measurement of hydrologic variables of diverse ecosystems. This has the capability of providing synoptic and repetitive measurements of large areas unattainable from point sampling at the earth's surface. Also provides a unique opportunity to evaluate effects of alternative land management practices on hydrologic characteristics. Satellite data will permit the location and mapping of snow distribution and subsequent zones of melt; will facilitate present research related to predicting snowmelt runoff, and stream flow forecasts will be enhanced. Albedo and energy regimes information will strengthen estimates of evapotranspiration and soil moisture content of diverse vegetation and soil types. Solar radiation data collected at field locations and research sites will be provided for development and testing of statistical analyses. Data will be developed to evaluate effects of meterological variables on forest and water ecosystems.

Progress: The energy balance model for predicting snowmelt under different forest stand and harvesting conditions has been completed and will be used during this forthcoming snowmelt season. Analysis of nutrients and their movement within the upper soil profile under different harvesting systems are near completion and statistical analysis are presently being conducted. Baseline nutrient and water yield data from a forested watershed to be harvested and prescribed burned have been collected and analyzed to monitor and evaluate effects of these practices. Analysis of data from medium altitude aircraft indicated a high correlation (R equals 0.974) between density of EKTA- IR/15 film/filter combination and water table elevation of a perched peatland area. Low correlations existed between film density and mean water table depth which was attributed to the undulating surface of peatland areas. Differentiation between aquatic species and cover density by density level slicing was not significant.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0027, RESOURCE MANAGEMENT APPLICATION OF REMOTE SENSING

M.P. MEYER, Univ. of Minnesota, Agricultural Experiment Sta., *St. Paul, Minnesota* 55101 (MIN-19-037)

Objective: Improve and extend the capabilities of managers of vegetation, animal, soil, water and human resources.

Approach: Research of this type is, to some extent, unique in that it lends itself well to short-term development. Planning often takes longer than actual execution of the information-gathering portion of the project. Usually ground truth must be gathered at, or near, the time of overflight. From that point, results may be obtained rather quickly in that the desired phenomena are either visible, available and useful -- or they are not. Most remote sensing studies follow the following, approximate, format: Definition of the problem; design of equipment- vegetation stage (if involved)-film/filter/time-overflight-ground truth- analysis package; overflight(s) and (sometimes) simultaneous gathering of ground truth; image interpretation; data analysis; report and publication.

Progress: A sagebrush density analysis technique provides reliable data for sagegrouse management in conjunction with range livestock operations. A pilot high altitude CIR aerial photographic resource survey system successfully tested by BLM in Montana in 1972 is being applied to other large private and public ownerships. ERTS imagery proved capable of discriminating forest from nonforest lands in Minnesota and identifying 7 vegetation/land use classes in Montana. A 35mm aerial photography system became operational on all BLM management districts in Montana for monitoring forest, water, wildlife and range resources; wildland and agricultural land resources applications tests were initiated in Minnesota. Assisted Minnesota DNR in developing a system of continuing aerial photography of forested counties; parallel studies were established to develop specifications for reducing future purchase and interpretation costs. Extreme altitude CIR aerial photography was highly successful in Minnesota forest species identification. Tests of remote sensing techniques for identification and evaluation of stress and productivity in alfalfa and corn were continued; highly reliable results were obtained using CIR aerial photography for oak wilt detection.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0028, REMOTE SENSING APPLICATIONS FOR THE MANAGEMENT OF RENEWABLE NATURAL RESOURCES

P.T. TUELLER, Univ. of Nevada, Agricultural Experiment Sta., *Reno, Nevada* 89507 (NEV00611)

Objective: Investigate a variety of remote sensing techniques for application to Natural Resources management, Range, Forestry, Wildlife, Watershed and Outdoor Recreation. (Initially emphasis will be given to the study of images generated via photographic techniques in the visible and rear IR portions of the electromagnetic spectrum). Evaluate two potential sources of ground truth. (1) Actual on-the-ground measurements and (2) information obtained from large scale aerial photography. (The latter will be used when small scale photography such as that to be generated by ERTS-A or other small scale photography is to be evaluated). Develop photo interpretation keys and cost-benefit analysis that will define the usefulness of some or all of the interrelationships previously implied. Identify, from the above, input and output to form a single or series of planning and management systems for optimizing the utility of remote sensor data.

Progress: Work has been accomplished on ERTS-1 imagery in cooperation with NASA and the Geological Survey. ERTS-1 resolution capabilities and repetitive coverage has allowed the acquisition of several statewide inventories of natural resource features that had not been completed previously or could not be completed in any other way. Sequential imagery has proved its usefulness for mapping vegetation, following vegetation phenology changes, monitoring water quality and quantity changes in lakes and reservoirs, range readiness determinations, marshland management and other uses. Land capability classification is in progress. Large scale 70mm color and color infrared images are being used to evaluate erosion on Venada rangelands for the Bureau of Land Management. Data derived from 70mm large scale imagery is being used to quantitatively study plant succession and describe range condition. Techniques have been successfully developed and published for the evaluation of marshlands. 70mm imagery provides a cost effective means of studying these poor access sites.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0029, FIELD STUDIES OF AEROSOLS, ICE CRYSTALS AND BLOWING SNOW IN ANTARCTICA

A.W. HOGAN, State University of New York, School of Arts, *Albany, New York* 12224

It is proposed: 1. To observe aerosol concentration and size distribution at the surface on the South Polar plateau. 2. To observe aerosol concentration and size distribution from horizontal transects at high altitude with the aid of C-130 support aircraft. 3. To seed the lower atmosphere with dry ice to ascertain if supersaturation with respect to ice is generally present. Precipitating crystals will be replicated and optically analyzed.

SUPPORTED BY U.S. Natl. Science Foundation

5.0030, FACTORS AFFECTING AN OPTIMAL PHOTOGRAPHIC TECHNIQUE OF CASE-HARDENING OF ARID REGION UNCONSOLIDATED DEPOSITS 9876-EN

L.H. LATTMAN, Univ. of Cincinnati, Graduate School, *Cincinnati, Ohio* 45221 (DAHC04-74-G-0201)

To test the general validity of genetic classification and recognition criteria of carbonate cemented unconsolidated sediments in arid regions. Improves ability of army engineers, terrain specialists and photo interpreters to classify arid region urfaces in terms of vehicle trafficability, projectile impact effects, excavation, slope stability, drainage and water supply.

Two areas of known calcium carbonate cementation in southwestern United States will be studied to determine whether the processes identified in Nevada can be extrapolated to other regions.

Supporting agency address information: OCRD Research Office Durham, Durham, N.C. 27706

SUPPORTED BY U.S. Dept. of Defense - Army

5.0031, LANDSLIPS IN SOUTHEASTERN OHIO
K.R. EVERETT, Ohio State University, Agric. Res. & Devel. Center, *Wooster, Ohio* 44691 (OHO00401-S)

Objective: Apply information obtained at EORDC on landslip environment, mechanisms, rates and pattern of movement to a broader area of SE Ohio. Investigate relationships between landslips and landuse and develop regionally applicable recommendations for their control.

Approach: Areas of farm slope instability will be plotted on topographic maps and/or air photos to determine actual acreages affected in Noble and adjacent counties. As many of these areas as practicable will be examined to substantiate similarities or departures in form and mechanics from those studied at EORDC. Past and present landuse practices which may have contributed to such mass-movements will be evaluated and amendment recommendations formulated. A number of forested slopes will be studied to finally evaluate the value of reforestation in stabilizing the slopes of SE Ohio.

Progress: Slope movement grid 2 was resurveyed in late July. Preliminary analysis of the data indicate small movements are continuing and are of approximately the same magnitude as in previous surveys. Very extensive movements, on the order of 54 feet in one case, have affected Site 1. These motions began in March 1972 and accelerated in 1973. The most extensive movements have occurred outside the site. Most appear to be related to shallow slip circle slides which in lower slope positions become flows. These observations are in keeping with conclusions reached from trench studies conducted in 1967 and 1968. Movements are of sufficient size and rate to have begun to close off an adjacent stream bed. Air photo coverage has been obtained for the Northern half of the county. Evaluation of landslides and related landuse practices has just begun.

SUPPORTED BY Ohio State Government - Columbus

5.0032, MEASUREMENT OF 'OH' HYDROXYL IN THE STRATOSPHERE
P. SOLYAN, Univ. of Pittsburgh, Graduate School, *Pittsburgh, Pennsylvania* 15213 (048644 (TRAIS NO.))

To determine the vertical profile of 'OH' in the stratosphere.

Document provided to S.S.I.E. by the T.R.A.I.S.

SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

5.0033, DETERMINATION OF FRESH WATER QUANTITY STANDARDS FOR THE GUADALUPE ESTUARY AND SAN ANTONIO BAY SYSTEM, TEXAS
E. BRADLEY, State Parks & Wildlife Dept., *Austin, Texas* 78701 (04-3-042-43)

Objectives: To determine the parameters to be monitored within the estuarine system; to establish a data storage and retrieval system; and to determine salinity, temperature gradients and determine changes in nutrient levels associated with variations in river flow.

Procedure: Aerial photography missions will be flown over the study area on a regular basis. Data obtained from aerial remote sensing equipment will be analyzed. Stations will be established within the study area for sampling on a regular basis to obtain data on the physical, chemical and biological conditions as related to river flow. Biological samples will be taken on a regular basis to determine changes in the abundance and species composition of the estuarine fauna.

Progress: Hydrographic studies have indicated that 1) salinity in San Antonio Bay increases with depth; 2) turbidity is mostly influenced by wind; and 3) evaporation rate is essentially the same as for fresh water lakes.

Aerial photography data obtained from NASA is essentially complete and has been mapped. Man-made alterations include: 38.3 miles of dikes have been constructed, 1,366 acres of salt water lakes have been isolated or drained, 3,000 of emergent spoil has resulted from channel dredging, 75 miles of drainage ditches have been dredged, and 10.5 square miles of bay bottom has been dredged.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0034, PHOTOGRAMMETRIC OBSERVATION OF LAKE DISPERSION
P.R. WOLF, Univ. of Wisconsin, School of Engineering, *Madison, Wisconsin* 53706

Objectives: To develop and systematize terrestrial photogrammetric techniques for measurement of small-scale lake currents which are important to pollutant dispersion. To determine the rate and manner with which thermal pollutants mix with the receiving water body.

How information will be applied: Analysis of the data wll assist in understanding lake circulation patterns and provide increased confidence in analyzing local pollution problems, and the developed techniques will aid others who are interested in studying circulation patterns.

Accomplishment during the past twelve months: Using time lapse photography and analytical photogrammetric techniques, movements of drogues in the effluent plume from a power plant sited on Lake Michigan have been traced. Project emphasis is now on the use of terrestrial (land-based) cameras to trace water velocity vectors. This new approach circumvents the need for aircraft, and still provides good accuracy, low cost and ease of operation, particularly in near shore work. Some precision work using aerial photography has been summarized in an article by Wolf and T.J. Keating in Water Resources Bulletin (April 1973), 'Precise Water Velocity Measurements Using Photogrammetric Techniques,' and reprints have been circulated in response to university and industry requests. A second report has been submitted for Sea Grant publication: 'Terrestrial Photogrammetric Measurements of Surface Water Velocities.' This will be presented at the National Meeting of the American Society of Photogrammetry, in Washington, D.C., 9-13-74.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, OPERATIONAL MEASURES OF IN-FLIGHT PERFORMANCE (22)
M.A. HOFMANN, U.S. Army, Aviation Psychology Division, *Ozark, Alabama* 36360

To systematically explore, in an operational environment, variables which affect performance.

The approach will involve the utilization of an in-flight monitoring and recording device capable of sampling and recording nineteen channels of continuous analog and digital information. This system will interface with existing field equipment to provide continuous acquisition of data on pilot and aircraft performance during flight. Further, this recording device will be compatible with future equipment which permits the sampled data to be telemetered to a ground data processing and analysis station during flight. Projected areas of investigation include the determination of the effect of sleep deprivation induced fatigue on pilot performance, the effect of flight induced fatigue on aviator performance and the isolation of physiological indications of this degradation after prolonged flight. Investigations to determine the workload stress of various flight profiles currently employed by army aviation, will also be conducted and data pertaining to physiological and psychological limitations of efficient aviator performance will be obtained.

Supporting agency address information: MD R & D Command (Army), Aeromedical Res. Lab, Ft. Rucker, Ala. 36360

SUPPORTED BY U.S. Dept. of Defense - Army

6.0002, STUDIES OF NUTRITIONAL ADEQUACY & PHYSIOLOGIC EFFECTS OF DIETS FOR SPECIAL HUMAN FEEDING SITUATIONS
D.H. CALLOWAY, Univ. of California, Agricultural Experiment Sta., *Berkeley, California* 94720 (CA-B0-NTS-2393)

Objective: Determine the extent to which variation in source of nutrients influences physiologic functions and maintenance of nutritional status of humans.

Approach: Nutrient sources to be studied are foods and food forms designed to meet the specialized needs of individuals in unusual conditions, such as during space flights, or therapeutic regimens. Responses to be measured include but are not limited to gastrointestinal and renal functions, motor and psychomotor skills, acid-base balance, ketone-body production and intestinal gas formation and exchange. Initial studies will evaluate foods designed for present space flights, in terms of a large number of pertinent responses of healthy young men. Later studies will explore fewer areas of response in greater depth.

Progress: Evaluation of the nutritional adequacy of diets from records of food intake has been hampered by lack of tables of composition of the lesser studied nutrients in foods. Also, the number of nutrients required daily (about 40) makes monitoring diets very difficult. Hypotheses were tested that a small group of foods for which relatively complete nutrient content could be known, could substitute in calculation for thousands of foods eaten in the U.S., and that a few nutrients could be selected that would assure adequacy of the larger group of essentials. It was shown that errors in calculated nutrient content due to substitution of a few foods are much less than errors due to variation in nutrient content of foods. Correlating coefficients showed significant co-occurrence of nutrients in foods, enabling selection of vitamins A and B-6, folacin, pantothenic acid, calcium, iron and magensium as index nutrients. Energy need is increased during pregnancy but the magnitude is uncertain due to altered physical activity. Basal and work energy cost were measured in pregnant girls and daily need was calculated from records of daily activities. The girls were very sedentary, spending 90% of the day lying down or seated. Total energy need was about 2400 kcal/day in the last trimester.

SUPPORTED BY California State Government - Sacramento

6.0003, RESPIRATORY PARAMETERS IN BREATHING SYSTEM DESIGN

B. BISHOP, State University of New York, Graduate School, *Buffalo, New York* 14222 (F41609-75-C-0003)

Aircrew members may be required to use oxygen equipment for extended periods under physiologically stressful conditions. With present pressure-demand oxygen systems the user begins to experience decreased oxygenation during ascents beyond 34,000 ft, and measurable hypoxia as he exceeds 40,000 ft. Positive pressure breathing delays these effects & provides emergency descent protection from altitudes as high as 50,000 ft. In other operational situations negative pressure breathing may occur as a result of flow resistance imposed by long distances between regulator and mask such as in special C-130 operations, leaflet operations, & planned emergency oxygen systems of AABNCP and AWACS. Breathing resistance of the hose/tubing arrangement in the T-38 has been a suspected cause of physiologic incidents. Rebreather type systems, pressure suit helmets, & closed loop oxygen generation systems may impose abnormal oxygen and carbon dioxide concentrations. The purpose of this effort is to investigate the respiratory stresses encountered during positive & negative pressure breathing in combination with mild hypoxia or slightly elevated CO2 concentration & attempt to define the relative degree of respiratory stress imposed by each when they occur in combination. The combined effects of positive or negative pressure breathing with mild hypoxia and/or mild hypercarbia have not previously been studied. Data obtained from this study will augment the core biotechnology base, provide information for sizing of oxygen systems, and serve as a basis for establishing criteria of maximum acceptable positive pressure & negative pressure in combination w/mild hypoxia or slightly elevated CO2 concentrations. These data will be applicable to develop future breathing systems as well as for reevaluation of systems in current use.

Human volunteer subjects will be exposed to various low levels of positive or negative pressure breathing while inspiring mildly hypoxic or hypercarbic gas mixtures. Compensatory responses of the respiratory system will be examined & analyzed to determine the degree of physiologic stress imposed by these ventilatory stimuli singly and in combination, and the relative effect of each when imposed in combination. Data will include but not be limited to effects on tidal volume, frequency of breathing, pulmonary ventilation, & inspiratory/expiratory times.

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0004, RESEARCH ON THE VISCOELASTIC PROPERTIES OF SPINAL ELEMENTS SUBJECTED TO THE AEROSPACE ENVIRONMENTS

W. HOVEY, Univ. of Dayton, School of Engineering, *Dayton, Ohio* 45409 (F33615-74-C-4048)

The objective of this program is to conduct a series of related experiments to further delineate the nonlinear response characteristics of the primate and human spinal column subjected to the shock and vibration environment. These data are necessary to meet current operational design requirements, goals of future Air Force crash survival systems, and to analytically model the nature of the human and primate spinal column subjected to mechanical loads in an attempt to minimize musculoskeletal trauma.

Engineering materials properties tests will be conducted in excised vertebral segments and intervertebral disks. Compressive dynamic impact tests are planned on individual vertebral bodies, intervertebral disks, and fundamental vertebral units. Theoretical modeling studies will parallel the experimental effort.

Supporting agency address information: 6570 Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0005, ANALYSES OF STEREOPHOTOGRAPHS

R.E. HERRON, Texas Inst. For Rehab. & Res., *Houston, Texas* 77025 (F33615-74-C-5121)

To test the accuracy of estimating the weight, volume, location of the center of mass, and inertial tensors of segments, e.g., head, thigh, forearm, of living human beings. These parameters are basic to the development of analogs, either physical or mathematical, of the human body required to predict its reaction to very high acceleration environments and to design and evaluate equipment and systems to protect the body against such environments.

Estimates of the weight, volume, location of the center of mass, and inertial tensors of segments of cadavers for which the above parameters are known will be made by appropriate analyses of stereophotographs of the cadaver segments.

Supporting agency address information: 6570 Aerospace Medical Research Lab HE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

6.0006, EFFECTS OF HIGH INTENSITY MANEUVERING ACCELERATION AND REPETITIVE G ON PILOT PHYSIOLOGIC PERFORMANCE IN FIGHT-ATTACK AIRCRAFT

H.H. ERICKSON, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235

Flight operations with high performance tactical aircraft such as the F-15 and lightweight fighters will require continuous optimal crew performance during repetitive and maneuvering acceleration environments. The objective is to investigate the effects of gravitoinertial forces during maneuvering acceleration on pilot incapacitation and performance impairment, to define human physiologic tolerance and safe exposure limits to these environments, and to obtain data which can be used to evolve methods to improve man's g tolerance to match the structural capability of new generation aircraft.

Extensive evaluation of the cardiopulmonary and other organ systems in man and animals will be used to define endpoints to simulated air- combat maneuvering environments. Indirect instrumentation for physiologic evaluation will be used in man wherever feasible. Research will be conducted, in primates and other experimental animals, to define the effects of maneuvering and repetitive acceleration encountered in advanced aircraft systems such as the F-15 and lightweight fighters on cardiovascular performance, damage mechanisms, risk limits, and fatigue of the cardiovascular system. Repetitive and maneuvering acceleration research will be performed at different back angles in order to define the optimum back angle in lightweight fighter class aircraft.

Supporting agency address information: USAF School of Aerospace Medicine VN, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense - Air Force

SOCIAL SCIENCES

Includes Social Sciences (general); Administration and Management; Documentation and Information Science; Economics and Cost Analysis; Law and Political Science; and Urban Technology and Transportation.

9.0001, MODEL FOR FORECASTING AVIATION AND ECONOMIC ACTIVITY

UNKNOWN, Urban Sys. Res. & Engin. Inc., *Cambridge, Massachusetts* 02138 (048931 (TRAIS NO.))

The Federal Aviation Administration (FAA) has a continuing requirement to produce forecasts of aviation and economic activity. The need for these forecasts arises from at least three sources: 1) operational planning, staffing, and bugeting requirements, 2) airport development planning programs, and 3) special studies, including policy analyses and research and development planning.

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SUPPORTED BY U.S. Dept. of Transportation - Off. Sec.

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, INCONSTANT GEOMAGNETIC FIELD

D.B. BEARD, Univ. of Kansas, School of Liberal Arts, *Lawrence, Kansas* 66044

This grant supports research on the basic configuration of the magnetopause (the interface between the solar wind and the geomagnetic field) as a function of the tilt angle between the earth's dipole and the solar wind velocity, and now includes other effects and current systems as perturbations--the Van Allen radiation belts, the night time neutral current sheet, the altered pressure conditions created by the earth's bow shock, and the quasi-viscous magnetopause interaction resulting from magnetic field line reconnection. It also continues work on the Jovian magnetosphere and on comets which will extend and generalize our understanding of the interaction of high velocity magnetized plasma with gases or stationary magnetic fields.

SUPPORTED BY U.S. Natl. Science Foundation

10.0002, ASTRO-GEOPHYSICAL DATA PROGRAM

A.L. CARRIGAN, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - communications and surveillance. Deficiency - insufficient self-consistent data available for necessary correlation studies of upper atmosphere and space parameters. Research - employ advanced techniques to obtain, select, and correlate processed astrogeophysical data. How research contributes - improves space forecasting techniques. The objective of this work is to obtain, select, publish and disseminate geophysical and space data in a scientifically useful format to USAF and scientists at other government agencies, universities and industry. These are data which are produced by AFCRL scientists either inhouse or with contractual assistance. The environmental parameters considered include aeronomy, airglow, aurora, cosmic rays, geomagnetism, ionospheric and planetary physics and astrophysical and solar phenomena. Updated models of the trapped radiation environment are published periodically. Continuous publication of the included self-consistent parameters greatly facilitates important correlation studies for use in development of space forecasting techniques.

Supporting agency address information: AF Cambridge Research Laboratories PH, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

10.0003, COSMIC RAY VARIATIONS

M.A. POMERANTZ, Franklin Inst. of State of Pa., *Swarthmore, Pennsylvania* 19081 (F19628-70-C-0190)

AF function - communications and surveillance. Deficiency - inability to predict disruptions of communications in polar regions. Research - acquire and analyze cosmic radiation data obtained near north magnetic pole. How research contributes - provides knowledge of geophysical effects to enable prediction of radiation environment in area where USAF systems operate. The analysis of cosmic radiation data provides the only available means for probing the gross features of the interplanetary medium that are not accessible to spacecraft. Anisotropies that are studied with ground-based cosmic-ray detectors can be related to time variations in the intensities of the radiation in a specific region of space by very sophisticated analytical procedures. Analysis of data from energetic solar particle events, the modulation and anisotropies in the primary cosmic-ray intensity will be studied to deduce phenomena associated with the structure and dynamics of the interplanetary medium that controls charged particle motion between the sun and the earth. A much better understanding of these phenomena required for the precise prediction of the charged particle environment in the area where USAF systems now operate or are projected to operate in the future.

Supporting agency address information: AF Cambridge Research Laboratories PH, L. G. Hanscom Field, Bedford, Mass. 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

VOLUME 13 NUMBER 6 / MARCH 23, 1975

Scientific and Technical Aerospace Reports

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01 AERONAUTICS (GENERAL)

N75-14709*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EXPERIMENTAL AND ANALYTICAL STUDY OF AN INLET FOREBODY FOR AN AIRFRAME-INTEGRATED SCRAMJET CONCEPT
Earl H. Andrews, Jr., Anthony M. Agnone (New York Univ.), and S. Z. Pinckney Washington Jan. 1975 60 p refs
(NASA-TM-X-3158; L-9836) Avail: NTIS HC $4.25 CSCL 01B

Preliminary analytical and experimental inlet forebody investigations have been conducted at Mach numbers of 6.0 and 8.5. The forebody design concept consisted of a sharp-nosed right circular cone followed by elliptical cross sections. This concept resulted in swept isentropic compression which would allow swept cowl leading edges. Measurements were made to define the condition of the inviscid flow field developed by the forebody, including flow profiles in the vicinity of cowl leading-edge stations, and the three-dimensional boundary-layer effects. The investigation verified some of the expected differences between the predicted and the experimental results. Author

N75-14710# Advisory Group for Aerospace Research and Development, Paris (France).
AGARD HIGHLIGHTS, MARCH 1974
Mar. 1974 30 p
(AGARD-Highlights-74/1) Avail: NTIS HC $3.75

The activities and accomplishments of the Advisory Group for Aerospace Research and Development (AGARD) during the first quarter of 1974 are discussed. Some of the subjects considered are: (1) using science and technology to meet military requirements at reduced cost, (2) preliminary design applications for reducing development, production, and operational costs of aircraft systems, (3) atmosphere pollution by aircraft engines, and (4) design and development of large wind tunnels. Author

N75-14711# Advisory Group for Aerospace Research and Development, Paris (France).
THE PERKINS-GLASSER LECTURES, MARCH 1974
Sep. 1974 27 p In ENGLISH; partly in FRENCH
(AGARD-Highlights-74/2) Avail: NTIS HC $3.75

An address to the Advisory Group for Aerospace Research and Development (AGARD) which was delivered in September, 1974 is presented. The subject of the address is the Impact of Research and Development on the United States Air Force. Some of the topics considered in the address are: (1) the National support of research, (2) basic and applied research in the Air Force, (3) development of inertial guidance systems, and (4) development of electronic digital computer. Areas of interest involved the methods for funding research and development activities and the process for making new technology available to industry. Author

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

N75-14712 + Engineering Sciences Data Unit, London (England).
SUBSONIC LIFT-DEPENDENT DRAG DUE TO BOUNDARY LAYER OF PLANE, SYMMETRICAL SECTION WINGS
Nov. 1966 2 p
(ESDU-66032-Amend-A) Copyright. Avail: NTIS HC $12.00

The variation of the coefficient of drag with the coefficient of lift for a wing or wing-body combination at subcritical Mach numbers is expressed as two straight lines intersecting at a lift coefficient. A mathematical model is developed to show the relationships of these aerodynamic coefficients. The effects of wing section, planform, Mach number, and Reynolds number are analyzed. The data are based on wind tunnel tests of wings and wing-body combinations in which the wings have conventional airfoil sections. Author

N75-14713*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AERODYNAMIC DAMPING AND OSCILLATORY STABILITY OF A MODEL OF A PROPOSED HL-10 VEHICLE IN PITCH AT MACH NUMBERS FROM 0.20 TO 2.86 AND IN YAW AT MACH NUMBERS FROM 0.20 TO 1.20
Robert A. Kilgore and Edwin E. Davenport 15 Oct. 1974 41 p refs
(NASA-TM-X-72619) Avail: NTIS HC $3.75 CSCL 01B

Wind tunnel tests of a proposed HL-10 lifting body vehicle were conducted to determine the subsonic and transonic aerodynamic characteristics. The conditions under which the tests were conducted are described. The tests indicate that the configuration has slightly positive damping in pitch except at higher angles of attack at Mach numbers of 0.8, 0.9, and 1.0. At supersonic speeds, the configuration has positive damping in pitch for all test conditions. At subsonic and transonic speed, the configuration has positive damping and positive stability in yaw for all test conditions. Author

N75-14714*# Tennessee Univ., Knoxville.
INVESTIGATION OF THE KLINE-FOGLEMAN AIRFOIL SECTION FOR ROTOR BLADE APPLICATIONS Semiannual Report, 1 May - 30 Nov. 1974
Edward Lumsdaine, William S. Johnson, Lynn M. Fletcher, and Judith E. Peach 15 Dec. 1974 26 p refs
(Grant NsG-1054)
(NASA-CR-141282; AE-74-1054-1) Avail: NTIS HC $3.75 CSCL 01B

Wind tunnel tests of a wedgeshaped airfoil with sharp leading edge and a spanwise step were conducted. The airfoil was tested with variations of the following parameters: (1) Reynolds number, (2) step location, (3) step shape, (4) apex angle, and (5) with the step on either the upper or lower surface. The results are

compared with a flat plate and with wedge airfoils without a step having the same aspect ratio. Water table tests were conducted for flow visualization and it was determined that the flow separates from the upper surface at low angles of attack. The wind tunnel tests show that the lift/drag ratio of the airfoil is lower than for a flat plate and the pressure data show that the airfoil derives its lift in the same manner as a flat plate.
Author

N75-14715*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
THEORETICAL CONSIDERATIONS OF SOME NONLINEAR ASPECTS OF HYPERSONIC PANEL FLUTTER Final Report, 1 Sep. 1965 - 31 Aug. 1970
S. C. McIntosh, Jr. Nov. 1974 72 p refs
(Grant NGR-05-020-102)
(NASA-CR-140896; SU-DAAR-491) Avail: NTIS HC $4.25 CSCL 01B

A research project to analyze the effects of hypersonic nonlinear aerodynamic loading on panel flutter is reported. The test equipment and procedures for conducting the tests are explained. The effects of aerodynamic linearities on stability were evaluated by determining constant-initial-energy amplitude-sensitive stability boundaries and comparing them with the corresponding linear stability boundaries. An attempt to develop an alternative method of analysis for systems where amplitude-sensitive instability is possible is presented. Author

N75-14716*# Old Dominion Univ. Research Foundation, Norfolk, Va. School of Engineering.
POWER REQUIREMENT OF ROTATING RODS IN AIR-FLOW
P. S. Barna and Gary R. Crossman Sep. 1974 19 p refs
(Contract NAS1-11707)
(NASA-CR-132556; TR-74-M6) Avail: NTIS HC $3.25 CSCL 01B

Experiments were performed to determine the power required for rotating a rotor disc fitted with a number of radially arranged rods placed into a ducted airflow. An array of stationary rods, also radially arranged, were placed upstream close to the rotor with a small gap between the rods to cause wake interference. The results show that power increased with increasing airflow and the rate of increase varied considerably. At lower values of airflow the rate of increase was larger than at higher airflow and definite power peaks occurred at certain airflow rates, where the power attained a maximum within the test airflow range. During the test a maximum blade passage frequency of 2037 Hz was attained. Author

N75-14717*# New Technology, Inc., Huntsville, Ala.
STUDY OF DYNAMIC CHARACTERISTICS OF AEROELASTIC SYSTEMS UTILIZING RANDOMDEC SIGNATURES Final Report
C. S. Chang 30 Jan. 1975 150 p refs
(Contract NAS1-12249)
(NASA-CR-132563) Avail: NTIS HC $5.75 CSCL 01B

The feasibility of utilizing the random decrement method in conjunction with a signature analysis procedure to determine the dynamic characteristics of an aeroelastic system for the purpose of on-line prediction of potential on-set of flutter was examined. Digital computer programs were developed to simulate sampled response signals of a two-mode aeroelastic system. Simulated response data were used to test the random decrement method. A special curve-fit approach was developed for analyzing the resulting signatures. A number of numerical 'experiments' were conducted on the combined processes. The method is capable of determining frequency and damping values accurately from randomdec signatures of carefully selected lengths. Author

N75-14718*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COLD-AIR ANNULAR-CASCADE INVESTIGATION OF AERODYNAMIC PERFORMANCE OF COOLED TURBINE VANES. 2: TRAILING-EDGE EJECTION, FILM COOLING, AND TRANSPIRATION COOLING
Louis J. Goldman and Kerry L. McLallin Washington Jan. 1975 36 p refs
(NASA-TM-X-3180; E-8049) Avail: NTIS HC $3.75 CSCL 21E

The aerodynamic performance of four different cooled vane configurations was experimentally determined in a full-annular cascade at a primary- to coolant-total-temperature ratio of 1.0. The vanes were tested over a range of coolant flow rates and pressure ratios. Overall vane efficiencies were obtained and compared, where possible, with the results obtained in a four-vane, annular-sector cascade. The vane efficiency and exit flow conditions as functions of radial position were also determined and compared with solid (uncooled) vane results. Author

N75-14719*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AERODYNAMIC PERFORMANCE OF A FULLY FILM COOLED CORE TURBINE VANE TESTED WITH COLD AIR IN A TWO-DIMENSIONAL CASCADE
Roy G. Stabe and John F. Kline Washington Jan. 1975 20 p refs
(NASA-TM-X-3177; E-8131) Avail: NTIS HC $3.25 CSCL 01B

The aerodynamic performance of a fully film cooled core turbine vane was investigated experimentally in a two-dimensional cascade of 10 vanes. Three of the 10 vanes were cooled; the others were solid (uncooled) vanes. Cold air was used for both the primary and coolant flows. The cascade test covered a range of pressure ratios corresponding to ideal exit critical velocity ratios of 0.6 to 0.95 and a range of coolant flow rates to 7.5 percent of the primary flow. The coolant flow was varied by changing the coolant supply pressure. The principal measurements were cross-channel surveys of exit total pressure, static pressure, and flow angle. The results presented include exit survey data and overall performance in terms of loss, flow angle, and weight flow for the range of exit velocity ratios and coolant flows investigated. The performance of the cooled vane is compared with the performance of an uncooled vane of the same profile and also with the performance obtained with a single cooled vane in the 10-vane cascade. Author

N75-14720*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COLD-AIR PERFORMANCE OF A 12.766-CENTIMETER-TIP-DIAMETER AXIAL-FLOW COOLED TURBINE. 1: DESIGN AND PERFORMANCE OF A SOLID BLADE CONFIGURATION
Jeffrey E. Haas and Milton G. Kofskey Washington Jan. 1975 23 p refs Prepared in cooperation with Army Air Mobility Res. and Develop. Lab., Cleveland
(NASA-TN-D-7881; E-8124) Avail: NTIS HC $3.25 CSCL 01A

A solid blade version of a single-stage, axial-flow turbine was investigated to determine its performance over a range of speeds from 0 to 105 percent of equivalent design speed and over a range of total to static pressure ratios from 1.62 to 5.07. The results of this investigation will be used as a baseline for comparison with those obtained from a cooled version of this turbine. Author

N75-14721*# Old Dominion Univ. Research Foundation, Norfolk, Va.
FAST RESPONSE VANES FOR SENSING FLOW PATTERNS IN HELICOPTER ROTOR ENVIRONMENT
P. S. Barna and Gary R. Crossman Jun. 1974 30 p refs
(Contract NAS1-11707)
(NASA-CR-132545) Avail: NTIS HC $3.75 CSCL 01B

Wind tunnel experiments were conducted on four small-scale flow-direction vanes for the determination of aerodynamic response. The tests were further extended to include a standard sized low-inertia vane currently employed in aircraft flight testing. The four test vanes had different aspect ratios and were about 35 percent of the surface area of the standard vane. The test results indicate satisfactory damping and frequency response for all vanes tested and compare favorably with the standard design. Author

N75-14722*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FAIL-SAFE SYSTEM FOR ACTIVITY COOLED SUPERSONIC

AND HYPERSONIC AIRCRAFT

Robert A. Jones, Dorothy O. Braswell, and Christine B. Richie Washington Jan. 1975 21 p
(NASA-TM-X-3125; L-9685) Avail: NTIS HC $3.25 CSCL 01C

A fail-safe-system concept was studied as an alternative to a redundant active cooling system for supersonic and hypersonic aircraft which use the heat sink of liquid-hydrogen fuel for cooling the aircraft structure. This concept consists of an abort maneuver by the aircraft and a passive thermal protection system (TPS) for the aircraft skin. The abort manuever provides a low-heat-load descent from normal cruise speed to a lower speed at which cooling is unnecessary, and the passive TPS allows the aircraft skin to absorb the abort heat load without exceeding critical skin temperature. On the basis of results obtained, it appears that this fail-safe-system concept warrants further consideration, inasmuch as a fail-safe system could possibly replace a redundant active cooling system with no increase in weight and would offer other potential advantages. Author

N75-14723*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

AERODYNAMIC ANALYSIS OF SEVERAL HIGH THROAT MACH NUMBER INLETS FOR THE QUIET CLEAN SHORT-HAUL EXPERIMENTAL ENGINE

James A. Albers, Norbert O. Stockman, and John J. Hirn Washington NASA Jan. 1975 21 p refs
(NASA-TM-X-3183; E-8132) Avail: NTIS HC $3.25 CSCL 01A

The results of an analytical study to investigate internal and external surface Mach numbers on several inlet geometries for possible application to the nacelle of the Quiet Clean Short-Haul Experimental Engine (QCSEE) are presented. The effects of external forebody geometry and internal lip geometry were illustrated at both low-speed and cruise conditions. Boundary-layer analyses were performed on several geometries to determine if lip flow separation might exist. The results indicated that inner-surface Mach number level and gradient could be reduced with inlets at a 50 deg incidence angle by blunting the external forebody geometry. The external Mach numbers at cruise conditions indicated that a compromise in the external forebody bluntness might be required to satisfy both low-speed and cruise conditions. For a fixed value of bluntness parameter, no lip flow separation was indicated for the 1.46- and 1.57-area-contraction-ratio inlets at low-speed conditions. However, a lip separation condition was obtained with the 1.37-contraction-ratio inlet. The QCSEE nacelle design takeoff operating condition (incidence angle of 50 deg and free-stream Mach number of 0.12) resulted in higher peak surface Mach numbers than the design crosswind (incidence angle of 90 deg and free-stream Mach number of 0.05) or static condition. Author

N75-14724*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

AERODYNAMIC PERFORMANCE OF A CERAMIC-COATED CORE TURBINE VANE TESTED WITH COLD AIR IN A TWO-DIMENSIONAL CASCADE

Roy G. Stabe and Curt H. Liebert Washington NASA Jan. 1975 15 p refs
(NASA-TM-X-3191; E-8137) Avail: NTIS HC $3.25 CSCL 01A

The aerodynamic performance of a core turbine vane with a ceramic coating was investigated experimentally in a two-dimensional cascade of 10 vanes. The vane was first tested with a rough coating and then retested after the coating had been smoothed. The test fluid was atmospheric air. The cascade tests covered a range of pressure ratios corresponding to ideal exit critical velocity ratios of 0.6 to 0.95. The principal measurements were cross-channel surveys of exit total pressure, static pressure, and flow angle. The results presented include exit survey results and overall performance in terms of flow angle, weight flow, and kinetic energy loss. The performance of the ceramic-coated vanes is compared with the performance of an uncoated vane having a similar profile. Author

N75-14725*# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Lab.

USER'S MANUAL FOR COMPUTER PROGRAM ROTOR

Masahiro Yasue Aug. 1974 235 p refs
(Contract NAS2-7262)
(NASA-CR-137553; ASRL-TR-174-2) Avail: NTIS HC $7.50 CSCL 01B

A detailed description of a computer program to calculate tilt-rotor aircraft dynamic characteristics is presented. This program consists of two parts: (1) the natural frequencies and corresponding mode shapes of the rotor blade and wing are developed from structural data (mass distribution and stiffness distribution); and (2) the frequency response (to gust and blade pitch control inputs) and eigenvalues of the tilt-rotor dynamic system, based on the natural frequencies and mode shapes, are derived. Sample problems are included to assist the user. Author

N75-14726*# Rochester Applied Science Associates, Inc., N.Y.

DEVELOPMENT OF AN ANALYSIS FOR THE DETERMINATION OF COUPLED HELICOPTER ROTOR/CONTROL SYSTEM DYNAMIC RESPONSE. PART 2: PROGRAM LISTING Final Report

Lawrence R. Sutton Washington NASA Jan. 1975 94 p
(Contract NAS1-10856)
(NASA-CR-2453) Avail: NTIS HC $4.75 CSCL 01C

A theoretical analysis is developed for a coupled helicopter rotor system to allow determination of the loads and dynamic response behavior of helicopter rotor systems in both steady-state forward flight and maneuvers. The effects of an anisotropically supported swashplate or gyroscope control system and a deformed free wake on the rotor system dynamic response behavior are included. Author

N75-14727*# Nielsen Engineering and Research, Inc., Mountain View, Calif.

COMPUTER PROGRAMS FOR CALCULATING THE STATIC LONGITUDINAL AERODYNAMIC CHARACTERISTICS OF WING-BODY-TAIL CONFIGURATIONS

Michael R. Mendenhall, Frederick K. Goodwin, Marnix F. E. Dillenius, and David M. Kline Washington NASA Jan. 1975 223 p refs
(Contract NAS2-7347)
(NASA-CR-2474) Avail: NTIS HC $7.25 CSCL 01B

Four computer programs developed to calculate the longitudinal aerodynamic characteristics of wing-body and wing-body-tail combinations are presented. The R1307 program is based on a linear method and is limited to the small range of angles of attack for which the lift and moment characteristics of wings and bodies are linear with angle of attack. The CRSFLW program is based on a crossflow method of predicting the forces and moments on bodies alone or wing-body combinations over a large angle of attack range. The SUBSON program predicts the longitudinal aerodynamic characteristics of wing-body-tail combinations at subsonic speeds and at angles of attack for which symmetrical pairs of vortices are shed from the body nose and the leading and side edges of the lifting surfaces. Program SUPSON predicts the longitudinal aerodynamic characteristics of wing-body-tail combinations at supersonic speeds in the same angle-of-attack range. A description of the use of each program, instructions for preparation of input, a description of the output, program listings, and sample cases for each program are included. Author

N75-14728# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Rettungs- und Bergungssysteme.

PROGRAM FOR TESTING THE INFLUENCES OF THE MASS AND VELOCITY PARAMETERS ON PERFORMANCE DATA AND CHARACTERISTICS OF PARACHUTE LOAD SYSTEMS

Karl-Friedrich Doherr and Christos Saliaris 7 Aug. 1974 22 p refs In GERMAN; ENGLISH summary
(DLR-MITT-74-31) Avail: NTIS HC $3.25; DFVLR, Porz, West Ger. 9 DM

A test program was designed for investigating the effects of mass and velocity parameters on the performance characteristics of parachute load systems. Both parameters can be investigated in a parachute gun launcher with relatively small effort and at low costs. But for comparison purposes full scale tests must be performed at different altitudes (gas densities) to assure the validity of experimental rresults gained from model tests at sea level.

Therefore, both free flight drop tests from aircraft and rocket boosted parachute tests were envisaged. ESRO

N75-14729# West Virginia Univ., Morgantown. Dept. of Aerospace Engineering.
THRUST AUGMENTED WING SECTIONS IN POTENTIAL FLOW
James Dennis Wilson, John L. Loth, and Subrato Chandra Aug. 1974 147 p refs
(Contract N00014-68-A-0512; NR Proj. 215-163)
(AD-786221; TR-25) Avail: NTIS CSCL 01/1

A method is presented for calculating the incompressible, potential flow for an arbitrary thrust augmented wing section, possibly experiencing inflow over portions of its surface. The solution includes the shape of an inviscid jet leaving the airfoil calculated by an automatic iteration procedure. The problem is formulated by covering the airfoil-jet surface with line segments which carry velocity discontinuity distributions and satisfy the boundary condition on velocity at the midpoints of the segments. Applying the boundary condition for a particular jet shape leads to a set of linear algebraic equations to be solved for the velocity discontinuity strengths. The final jet geometry is found when the net pressure force for each set of surface elements on the front and back of the jet is balanced by the centrifugal force acting on the fluid within the jet et the corresponding location. (Modified author abstract) GRA

N75-14730# West Virginia Univ., Morgantown. Dept. of Aerospace Engineering.
NAVAL V/STOL AERODYNAMICS Final Summary Report, 15 Jul. 1968 - 28 Feb. 1974
Jerome B. Fanucci, John L. Loth, Nathan Ness, and Richard E. Walters Feb. 1974 161 p refs
(Contract N00014-68-A-0512; NR Proj. 215-163)
(AD-786222; TR-40) Avail: NTIS CSCL 01/1

This report is a summary of a large number of research tasks performed in the area of low speed aerodynamics. The research projects are fundamental in nature but of relevance to the Navy. Both the theoretical and experimental aspects of each problem have been studied and the results are compared. Numerical methods have been used in self contained computer programs to calculate the aerodynamic performance of the following configurations: Two dimensional circulation controlled wings with blowing and regions of separated flow; two dimensional thrust augmented VTOL wings with jet entrainment effects; and rotors in hover with arbitrary twist, taper, and airfoil cross section using nonlinear lifting surface theory. Additional experimental work has been done in the area of rotor wake instabilities in and out of ground effect. (Modified author abstract) GRA

N75-14731# Army Foreign Science and Technology Center, Charlottesville, Va.
UT-15, SERIES 2 PARACHUTE
L. Kalabukhova and S. Rudevskaya 17 Oct. 1973 9 p Transl. into ENGLISH from Krylya Rodiny (USSR), no. 4, 1973 p 18-19
(AD-786817; FSTC-HT-23-1783-73) Avail: NTIS CSCL 01/3

The 24-shroud, capron sports parachute opens at speeds up to 225 km/h; descent rate is 5.1 m/sec; canopy area is 51 sq m. Construction, maneuvering, rigging and user adjustment of the parachute are discussed. GRA

N75-14732# Ballistic Research Labs., Aberdeen Proving Ground, Md.
BOUNDARY-LAYER STUDIES ON SPINNING BODIES OF REVOLUTION
Walter B. Sturek 1973 15 p refs
(AD-785688) Avail: NTIS CSCL 19/1

This paper describes some results from a series of experimental studies of the viscous boundary-layer on spinning bodies of revolution. The objectives of these studies are: (1) provide data which will help guide the development of a useful procedure for computing Magnus effects on aerodynamic shapes of interest in artillery projectile design; (2) verify the significance of the boundary-layer configuration--laminar, transitional, turbulent--on the resulting Magnus force; and (3) develop a better understanding of the physics of the three-dimensional boundary-layer on spinning bodies of revolution at angle of attack. GRA

N75-14733# Army Foreign Science and Technology Center, Charlottesville, Va.
WORLD CHAMPIONSHIP PARACHUTES
L. Kalabukhova Jan. 1974 10 p Transl. into ENGLISH from Krylya Rodiny (USSR), no. 1, 1973 p 32-34
(AD-786838; FSTC-HT-23-1511-73) Avail: NTIS CSCL 01/3

The article discusses the different types of parachutes used for sport jumping. These include French, Czech, Russian and American chutes. Results of the XI world championships are given. Improvements in the design and engineering of parachutes are given and development of new types of chutes such as the Para-Plane is included. GRA

N75-14734# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
REVIEW OF METHODS OF SOLUTION OF AFTERBODY/EXHAUST NOZZLE FLOW FIELDS
Wladimiro Calarese Jan. 1974 165 p refs
(AF Proj. 1476)
(AD-787459; AFFDL-TR-74-108) Avail: NTIS CSCL 20D

A review is made of methods of solution for afterbody/exhaust nozzle flow fields in different flight regimes. For the transonic regime airfoil solutions are also presented. A comparison between various theories and experiments is made wherever considered necessary to show the state-of-the-art. Most of the available theories are selected and correlated. Author (GRA)

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N75-14735*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SUMMARY OF THE RECENT SHORT-HAUL SYSTEMS STUDIES
Raymond C. Savin, Thomas L. Galloway, Darrell E. Wilcox, George C. Kenyon, Mark D. Ardema, and Mark H. Waters Washington Jan. 1975 60 p refs
(NASA-TM-X-3010; A-5333) Avail: NTIS HC $4.25 CSCL 01C

The results of several NASA sponsored high density short haul air transportation systems studies are reported as well as analyzed. Included are the total STOL systems analysis approach, a companion STOL composites study conducted in conjunction with STOL systems studies, a STOL economic assessment study, an evaluation of STOL aircraft with and without externally blown flaps, an alternative STOL systems for the San Francisco Bay Area, and the quiet, clean experimental engine studies. Assumptions and results of these studies are summarized, their differences, analyzed, and the results compared with those in-house analyses performed by the Systems Studies Division of the NASA-Ames Research Center. Pertinent conclusions are developed and the more significant technology needs for the evaluation of a viable short haul transportation system are identified. Author

N75-14736# Naval Postgraduate School, Monterey, Calif.
A RISK AND COMPARATIVE ANALYSIS OF AIRCRAFT ACCIDENT DATA M.S. Thesis
James Michael Burin Sep. 1974 91 p refs
(AD-787426) Avail: NTIS CSCL 01/2

Aircraft accident data was analyzed to investigate the differences in risk of Naval aircraft and to develop some overall risk measure. To analyze risk, a flight was divided into four risk areas: takeoff, inflight, transition, and landing. Accidents were assumed to occur according to a Poisson process and tests were carried out to prove the validity of the Poisson assumption. The poisson model yielded two factors, the exposure to the risk areas and the performance in them. A procedure to predict risk was developed. A statistic, improvement index, was developed to allow a direct comparison between different

types of aircraft with respect to safety performance. (Modified author abstract) GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *Communications*.

N75-14737*# Radio Corp. of America, Camden, N.J.
ONE WAY DOPPLER EXTRACTOR. VOLUME 1: VERNIER TECHNIQUE Final Report
R. W. Blasco, S. Klein, E. J. Nossen, E. R. Starner, and J. A. Yanosov Nov. 1974 323 p refs
(Contract NAS9-13517)
(NASA-CR-141467; Rept-13517-F-1) Avail: NTIS HC $9.25 CSCL 17G

A feasibility analysis, trade-offs, and implementation for a One Way Doppler Extraction system are discussed. A Doppler error analysis shows that quantization error is a primary source of Doppler measurement error. Several competing extraction techniques are compared and a Vernier technique is developed which obtains high Doppler resolution with low speed logic. Parameter trade-offs and sensitivities for the Vernier technique are analyzed, leading to a hardware design configuration. A detailed design, operation, and performance evaluation of the resulting breadboard model is presented which verifies the theoretical performance predictions. Performance tests have verified that the breadboard is capable of extracting Doppler, on an S-band signal, to an accuracy of less than 0.02 Hertz for a one second averaging period. This corresponds to a range rate error of no more than 3 millimeters per second. Author

N75-14738# Northrop Corp., Hawthorne, Calif.
OPERATIONAL EVALUATION OF AN AIRBORNE OMEGA NAVIGATION SYSTEM. VOLUME 1: BACKGROUND AND RESULTS Final Report, Jun. 1971 - Oct. 1973
R. Latchford and R. C. Sanders Oct. 1973 43 p
(Contract DOT-FA71WA-2648)
(AD-780954; FAA-RD-74-10-1) Avail: NTIS HC $3.75

The evaluation of the Omega Navigation System for aircraft utilization on routes traversing the North Atlantic from the East coast of the United States to Europe is reported. The user equipment was a commercial version of the AN/ARN-99 which is an automatic computerized Omega receiver designed for airborne use and was installed on a DC-8 type aircraft. The principal areas of interest in this evaluation were operational utility, signal reliability and track comparison with other aids available. The Omega system demonstrated its ability to provide smooth bounded position information in a varying and somewhat limited signal environment due to a transitional transmitter configuration. Author

N75-14739# Northrop Corp., Hawthorne, Calif.
OPERATIONAL EVALUATION OF AN AIRBORNE OMEGA NAVIGATION SYSTEM. VOLUME 2: APPENDICES Final Report, Jun. 1971 - Oct. 1973
R. Latchford and R. C. Sanders Oct. 1973 86 p
(Contract DOT-FA71WA-2648)
(AD-780838; FAA-RD-74-10-2) Avail: NTIS HC $4.75
For abstract, see N75-14738.

N75-14740# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
TROPOSPHERIC RANGE ERROR CORRECTIONS FOR THE NAVSTAR SYSTEM Interim Report
Edward E. Altshuler and Paul M. Kalaghan 16 Apr. 1974 13 p
(AF Proj. 8682)
(AD-786928; AFCRL-TR-74-0198) Avail: NTIS CSCL 17/7

NAVSTAR is a triservice satellite navigation system designed to provide the means for military aircraft, ships, and ground users throughout the world to obtain precise position and velocity information at any time of day, in any kind of weather. Since the user's position is measured by the time delays between his location and several satellites, the additional delay due to tropospheric refraction must be taken into account. For angles above 5 degrees the time delay, or corresponding range error, can be estimated from the local surface refractivity, if known. The worldwide statistics of surface refractivity analyzed in this report show that refractivity is correlated with site latitude, height above sea level, and season, all of which should be readily known. Regression lines for range error corrections based on these parameters are derived, and the accuracy of the corrections are estimated. At 5 degrees, the minimum elevation angle at which NAVSTAR is intended to be used, the range error is about 80 ft. (Modified author abstract) GRA

N75-14741# Lincoln Lab., Mass. Inst. of Tech., Lexington.
IMPROVED SATELLITE CONSTELLATIONS FOR CONUS ATC COVERAGE Project Report
Harry B. Lee and Andrew E. Wade 1 May 1974 226 p refs
(Contract DOT/TSC-RA-3-8)
(PB-233533/9; ATC-23; DOT/TSC-RA-3-8-4) Avail: NTIS HC $7.50 CSCL 17G

The report examines the problem of designing a constellation of orbiting satellites capable of supporting an aircraft navigation/surveillance service over CONUS. It is assumed that the aircraft positions are determined by hyperbolic multilateration using all satellites visible at elevation angles exceeding a minimum angle. Comprehensive analyses are presented of three baseline constellations. The constellations are representative of previous large, medium, and small constellations. The analyses include calculation of The Geometric Dilution of Precision (GDOP) during level flight, calculation of GDOP after a key satellite is deleted, and calculation of GDOP during aircraft banking. A new method of calculating GDOP is described. The method suggests that improved GDOP's can be obtained by placing satellites in retrograde orbits rather than the previous posigrade orbits. GRA

N75-14742# Army Electronics Command, Fort Monmouth, N.J.
ROTOR EFFECTS ON L-BAND SIGNALS RECEIVED BY HELICOPTER ANTENNAS: A THEORETICAL STUDY. PART 1: AMPLITUDE REDUCTION AND PHASE SHIFT. SHIELDING EFFECT Final Report
F. Schwering and C. M. DeSantis Sep. 1974 65 p
(DA Proj. 1T1-61102-B-31A)
(AD-787363; ECOM-4254) Avail: NTIS CSCL 17G

Rotor effects on L-band navigation signals received by helicopter antennas are examined theoretically. Two types of distortions are distinguished: (1) the amplitude reduction and phase shift of CW-signals due to periodic shadowing of the antenna by the rotor (shielding effect), and (2) the distortion of phase reversals assumed to occur at predetermined intervals in the incident signals. Numerical evaluations have been performed using the pertinent dimensions of a UH-1 heldicopter. It was found that the shielding effect may reduce the received power by 10 db while the phase shift does not exceed 90 degrees. (Modified author abstracts). GRA

N75-14743# Army Electronics Command, Fort Monmouth, N.J.
ROTOR EFFECTS ON L-BAND SIGNALS RECEIVED BY HELICOPTER ANTENNAS: A THEORETICAL STUDY. PART 2: DISTORTION OF PHASE REVERSALS Final Report
F. Schwering and C. M. DeSantis Sep. 1974 25 p
(DA Proj. 1T1-61102-B-31A)
(AD-787364; ECOM-4255) Avail: NTIS CSCL 17G

It was found that the distortion of phase reversals depends on the bandwidth of the navigation signals. However, rotor induced transients will be negligible after one or two carrier periods. (Modified author abstract) GRA

N75-14744# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
FAA/DOD LIAISON IN MANAGEMENT OF THE NATIONAL AVIATION SYSTEM M.S. Thesis
Ronald S. Brooks and Jerry L. Beatty Sep. 1974 160 p refs
(AD-787208; GSM/SM/74S-2) Avail: NTIS CSCL 17/7

This study describes and analyzes military and FAA liaison efforts which impact on the management of the National Aviation System. It begins with the historical development of the National Aviation System (NAS). The system is evolutionary in nature and most innovations have come from user demands and outside sources. Long term government responsibility to manage the system has been secondary to the operation and maintenance functions. There has been duplication of effort due to poor coordination on developing technology that led to improvement of the system. The methodology used was research of historical and contemporary literature, supplemented by personal interviews with individuals currently involved directly in the liaison process. The combination of extensive personal interviews and the many general and technical reports available emphasize the fractionalized responsibilities within the system and provide a diverse information base that is unavoidably large. (Modified author abstract) GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N75-14745*# Continental Airlines, Inc., Los Angeles, Calif.
INFLIGHT DATA COLLECTION FOR RIDE QUALITY AND ATMOSPHERIC TURBULENCE RESEARCH Final Report
Paul W. Kadlec and Roger C. Buckman Dec. 1974 57 p refs
(Contract NAS4-1982)
(NASA-CR-127492) Avail: NTIS HC $4.25 CSCL 01C

A flight test program to investigate the effects of atmospheric turbulence on passenger ride quality in large, wide-body commercial aircraft was conducted. Data were collected on a series of flight on a Boeing 747 aircraft. Atmospheric and aircraft performance data were obtained from special sensors, as well as conventional instruments and avionics systems normally available. Visual observations of meteorlogical conditions encountered were manually recorded during the flights. Author

N75-14746*# Rockwell International Corp., Los Angeles, Calif.
CONCEPTUAL DESIGN STUDY OF IMPROVED 1985 REMOTE LIFE-FAN V/STOL COMMERCIAL TRANSPORTS
Robert L. Cavage et al Washington NASA Jan. 1975 86 p refs
(Contract NAS2-6564)
(NASA-CR-2481) Avail: NTIS HC $4.75 CSCL 01C

A design study was conducted for a remote lift-fan commercial V/STOL transport for the 1985 time period. The investigation centered on the commercial short haul transportation application to carry 100 passengers over trip distances of 400 nautical miles from a vertical takeoff and landing, and 800 nautical miles after a 1600 foot STOL takeoff. The study included investigation of alternate numbers and arrangements of lift fans and gas generators, fan control margins, and structural concepts. The sensitivity of direct operating costs to major airframe parameters, airframe costs, propulsion costs, yearly aircraft utilization rate, and trip distances are evaluated. Author

N75-14747*# Rockwell International Corp., Los Angeles, Calif. Aircraft Div.
INFLUENCE OF PROPULSION SYSTEM SIZE, SHAPE, AND LOCATION ON SUPERSONIC AIRCRAFT DESIGN
Ellwood Bonner, Marshall H. Roe, Ray M. Tyson, and Ronald Y. Mairs Dec. 1974 200 p refs
(Contract NAS1-13105)
(NASA-CR-132544) Avail: NTIS HC $7.00 CSCL 01C

The effects of various propulsion system parameters on the characteristics of a supersonic transport were investigated. The effects of arbitrarily scaling engine size on wave drag, friction drag, drag-due-to-lift, wing sizing, airplane balance, and airplane weight were studied. These evaluations were made for two families of nacelle shapes, resulting from typical turbojet and turbofan installations. Also examined were effects of nacelle location, and the wing camber plane deformations required to cancel the nacelle interference pressure field at cruise Mach number (2.7 M) were determined. The most drag-sensitive parameter is found to be nacelle shape. Similarly, wing deformation requirements are found to be primarily affected by nacelle shape. Effects of engine size variations are noted primarily in airplane gross weight. Author

N75-14748*# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.
FLIGHT INVESTIGATION OF ROTOR/VEHICLE STATE FEEDBACK
Stanley J. Briczinski and Dean E. Cooper [1974] 173 p refs
(Contract NAS1-11563)
(NASA-CR-132546; SER-50905) Avail: NTIS HC $6.25 CSCL 01C

Analytic and test results of the Rotor/Vehicle State Feedback Investigation indicate that feedback networks can be used successfully to simulate the important flying quality and ride comfort aspects of mechanical flapping-feathering coupled arrangements. Factors such as accuracy of tip-path-plane resolution, computer time lags, control system hysteresis, and actuator dynamics are either negligible, can be compensated for, or do not sufficiently influence the results to alter this general conclusion. A ruggedized commercial computer, installed on a CH-53A helicopter, was programmed successfully to handle a wide variety of rotor and fuselage feedback schemes and related operating logic which was investigated during the flight test phase of this study. The program cycle time was approximately twice as fast as the most demanding sampling rate studied (24 samples per revolution). The investigation indicates that the dynamically varying first harmonic contributions (tip-path-plane coefficients) of main rotor blade flapping can be resolved from blade flapping measurements when data supplied to the resolver meet particular requirements. Author

N75-14749# McDonnell-Douglas Corp., St. Louis, Mo.
AERODYNAMIC DESIGN OF HIGH PERFORMANCE BIPLANE WINGS
Robert B. Addoms (Aerojet-General Corp., Tacoma, Wash.) and Frank W. Spaid 12 Sep. 1974 37 p refs Backup document for AIAA Synoptic scheduled for publication in Journal of Aircraft in July 1975
Avail: NTIS HC $3.75

A procedure for improving the maximum lift coefficient for biplanes is discussed. The procedure consists of tailoring the shape of a parent monoplane airfoil to the induced flowfield of a given biplane configuration. Such airfoils have greater camber than the sections from which they are derived, although the drag coefficient at cruise is not increased significantly. Results of an aircraft performance analysis indicate that a biplane may be superior to a monoplane when low speed maneuverability, short field performance, load carrying ability, and low cost are more important than maximum speed for a given power. Author

N75-14750# Boeing Vertol Co., Philadelphia, Pa.
DESIGN AND OPTIMIZATION ON STUDY OF THE ACTIVE ARM EXTERNAL LOAD STABILIZATION SYSTEM (AAELSS) FOR HELICOPTERS Final Report, Jun. 1973 - May 1974
Eugene Kisielowski, James H. Smith, and Robert W. Spittle Aug. 1974 136 p refs
(Contract DAAJ02-73-C-0100; DA Proj. 1F1-63209-DB-33)
(AD-787325; D210-10764-1; USAAMRDL-TR-74-55) Avail: NTIS CSCL 01/3

Presented are the results of the analytical study involving design optimization of the Active Arm External Load Stabilization System (AAELSS), whose technical and operational feasibility was conclusively demonstrated under Contract DAAJ02-72-C-0046. The program consisted of two phases: the analytical study, under which basic design parameters of the AAELSS were optimized, and the preliminary design phase of the improved system, under which a variety of different configurations were considered, including the conceptual design for the heavy lift helicopter (HLH). The final design configuration, although specifically tailored to the CH-47C helicopters, contains basic design elements directly applicable to the HLH and represents a considerable design improvement over the experimental system. Author (GRA)

N75-14751# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.
HELICOPTER SECONDARY STRUCTURES RELIABILITY AND MAINTAINABILITY INVESTIGATION Final Report, May 1972 - Jun. 1974
Kenneth B. Krieger Jul. 1974 168 p refs
(Contract DAAJ02-72-C-0070; DA Proj. 1F1-62205-A-11)
(AD-787334; SER-40846; USAAMRDL-TR-74-52) Avail: NTIS CSCL 01/3

Maintenance man-hours and downtime charged against secondary structures of aircraft have been excessive. It is assumed that this has been due to deficiencies in the design and test procedures for these components. This report investigates these problems and makes recommendations to alleviate them. Standards and specifications were reviewed for application to secondary structures on rotary-wing aircraft. A list was made up for detailed review. This study indicates that design and test criteria for secondary structure components subject to handling use and abuse must be expanded to include the functional loads applied in handling. The usual flight and ground load criteria are inadequate for designing and testing adequate secondary structures of the hinged-opening variety. (Modified author abstract) GRA

N75-14752# Radio Corp. of America, Burlington, Mass. Aerospace Systems Div.
INVESTIGATION OF INSPECTION AIDS Final Report, 18 Apr. 1973 - 24 May 1974
Richard L. Calhoon, Fred W. Hohn, James A. McNamee, Bruce B. Wierenga, and T. N. Cook Jul. 1974 199 p refs
(Contract DAAJ02-73-C-0059; DA Proj. 1F1-62205-A-11903)
(AD-787333; USAAMRDL-TR-74-44) Avail: NTIS CSCL 15/5

The investigation of inspection aids was performed to identify specific inspection requirements and recommend relatively small aids or indicators, current or conceptual, that will enhance the troubleshooting inspection/preventive maintenance process for Army helicopters. Inspection requirements and procedures for six helicopter types (AH-1, UH-1, CH-47, CH-54, OH-6, OH-58) were analyzed. Significant inspections were identified and the effectiveness and adequacy of presently used procedures and techniques was assessed. Areas where the inspector is highly dependent upon subjective judgment or cumbersome or ineffective procedures are employed were determined. Surveys of available off-the-shelf vendor aids and candidate conceptual inspection aids which offer improved inspection efficiency in these areas were performed. (Modified author abstract) GRA

N75-14753# Army Missile Command, Redstone Arsenal, Ala.
APPLICATION OF IMPEDANCE METHODS TO THE DESIGN OF ISOLATORS FOR HELICOPTER MOUNTED WEAPONS STORES
James M. Oliver 31 Jul. 1974 29 p refs
(DA Proj. 1M3-62303-A-214)
(AD-787293; RL-75-3) Avail: NTIS CSCL 01/3

The so-called mobility method of dynamic analysis is reviewed. How measurements under nonideal conditions can be carried out is described. A means of utilizing the method as a part of the design and testing of helicopter mounted equipment is presented. Author (GRA)

N75-14754# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
THE RESPONSE OF AIRCRAFT ENCOUNTERING AIRCRAFT WAKE TURBULENCE Final Report, Sep. 1972 - Apr. 1974
Robert C. Nelson Jun. 1974 141 p refs
(AF Proj. 1929)
(AD-787193; AFFDL-TR-74-29) Avail: NTIS CSCL 01/2

The investigation deals with the dynamic behavior of an airplane encountering aircraft wake turbulence. A digital computer simulation was developed to study the response of an aircraft flying into a trailing vortex wake. The simulation includes the complete six degree of freedom equations of motion, a description of the vortex velocity field, unsteady aerodynamics, and pilot control input. The parameters included the penetration angle, separation distance, aircraft size, and pilot control input. Predicted vortex induced motions are presented for general aviation, business, and light jet transport type aircraft. (Modified author abstract) GRA

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N75-14755# Cranfield Inst. of Technology (England).
A PROPOSAL FOR A SELF-CONTAINED INSTRUMENTATION SYSTEM FOR FLIGHT RESEARCH ON STABILITY AND CONTROL
V. Klein and R. Gregory Mar. 1974 74 p refs
(Cranfield-Aero-21) Avail: NTIS HC $4.25

The concept and possible realization of a self-contained instrumentation system for the measurement of stability and control characteristics of an aircraft are described. The recommended accuracy of the system is based on its relation to the accuracy of aerodynamic derivatives of an aircraft evaluated from flight data. Therefore several sets of simulated and measured data were analyzed. A survey of techniques used for the evaluation of these derivatives is also presented. Author

N75-14756# Pratt and Whitney Aircraft, West Palm Beach, Fla. Research and Development Center.
DESIGN FABRICATION, AND DEMONSTRATION OF A MINIATURIZED TIP CLEARANCE MEASURING DEVICE Final Report, Jul. 1973 - Apr. 1974
M. J. Ford, J. R. Hildebrand, and J. C. Prosser Sep. 1974 80 p refs
(Contract DAAJ02-73-C-0084)
(AD-787318; PWA-FR-6447; USAAMRDL-TR-74-67) Avail: NTIS CSCL 21C

This report describes the design, fabrication, and demonstration of a miniaturized turbine blade tip clearance measurement system for use with small gas turbine engines during engine operation. This system was originated by Pratt and Whitney Aircraft and uses laser light that is focused on the blade tips. The light reflected from the blade tips is imaged onto an output device. The relationship between the change in tip clearance and the change in position of the output light spot provides a direct indication of tip clearance. (Modified author abstract) GRA

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N75-14757# McDonnell-Douglas Corp., Long Beach, Calif.
DC-9 NOISE RETROFIT FEASIBILITY. VOLUME 2: UPPER GOAL NOISE, PERFORMANCE AND COST EVALUATION Final Report, Jan. - Sep. 1973
H. D. Whallon et al Dec. 1973 160 p refs
(Contract DOT-FA72WA-3116)
(AD-777895; MDC-J4355-Vol-2; FAA-RD-73-124-Vol-2) Avail: NTIS HC $5.00

Noise reduction of 4, 4, 5, and 10 EPNdB at the Federal Aviation Regulations (FAR) Part 36 sideline, takeoff, cutback, and approach measurement conditions, respectively was investigated. Exhaust system development tests were conducted on an engine static test stand to evaluate the upper goal exhaust system. Components of the upper goal nacelle were designed and fabricated. The components were ground static tested for effect on engine performance and noise. The initial daisy-with-ejector configuration showed good acoustical results but with

unacceptable performance losses, even after a number of modifications. An alternative configuration, using the same test hardware but adjusted to provide quieting by enlarging the nozzle area, essentially met acoustical and performance requirements. Static tests demonstrated predicted inflight noise reductions of 4.7, 4.0, 3.9, and 10.1 EPNdB at the sideline, takeoff, cutback, and approach measurement conditions, respectively, which approximate the FAA upper goal values. A cost study was conducted. Retrofit and production line installation costs and the effects on direct operating costs were estimated. The effects of the modification on block speed, fuel burned, payload range, takeoff field length and initial cruise altitude was determined.
Author

N75-14758# National Research Council of Canada, Ottawa (Ontario).
GAS TURBINE CYCLE CALCULATIONS: THERMODYNAMIC DATA TABLES FOR AIR AND COMBUSTION PRODUCTS FOR THREE SYSTEMS OF UNITS
M. S. Chappell and E. P. Cockshutt Aug. 1974 175 p refs
(NRC-14300; LR-579) Avail: NTIS HC $6.25

A procedure for calculating the thermodynamic properties of air and combustion products as encountered in open cycle gas turbines is presented. The procedure is based on a set of tables that consist of specific heat, enthalpy, and entropy data for dry air, as functions of temperature; an auxiliary table which provides fuel/air ratio corrections; and functions of temperature for all three thermodynamic parameters. The two principles leading to the one-dimensional tabular presentation are: (1) dry air and combustion products are semi-perfect gases, so that the specific heat, enthalpy, and entropy function are dependent solely on temperature, not pressure and (2) the fuel has a composition of 86.08 percent carbon and 13.92 percent hydrogen (by weight), so that the molecular weight of the combustion products is identical with that of dry air.
Author

N75-14759*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TWO DIMENSIONAL COLD AIR CASCADE STUDY OF A FILM COOLED TURBINE STATOR BLADE. 2: EXPERIMENTAL RESULTS OF FULL FILM COOLING TESTS
Herman W. Prust, Jr. Washington Jan. 1975 45 p refs
(NASA-TM-X-3153; E-8052) Avail: NTIS HC $3.75 CSCL 21E

The effect of full film cooling on the performance of a turbine stator blade was studied in a two-dimensional cascade. The blade contained 12 rows of coolant holes, 6 rows on the suction surface and 6 on the pressure surface. Separate tests were first made with coolant ejection from each of the 12 rows. Then successive tests were made with various combinations of coolant rows open, including full film cooling. The principal results are presented in terms of primary-air efficiency as a function of coolant fraction. In addition, the efficiency results of the multirow tests are compared with the multi-row efficiency predicted by adding the single-row results.
Author

N75-14760# Committee on Science and Astronautics (U. S. House).
AIRCRAFT NOISE ABATEMENT
Cotter, Wydler, William G. Wells, Jr., Carl Swartz, Darrell Branscome, and Patricia Schwartz Washington GPO Dec. 1974 47 p ref Rept. prepared by Subcomm. on Aeron. and Space Technol. of Comm. on Sci. and Astronaut., 93d Congr., 2d Sess., 5-6, and 18 Dec. and 24-25 Jul. 1974
(GPO-42-539) Avail: US Capitol, House Document Room

Various programs discussed before the subcommittee on aeronautics and space technology are analyzed. The following major areas are included: (1) results of the 23-airport study by the Department of Transportation; (2) two-segment landing approach program; (3) retrofit of civilian narrow-body jet aircraft and fleet; (4) aircraft noise abatement operating procedures; and (5) coordinated national aircraft noise abatement program. Recommendations and achievements of the subcommittee are summarized.
J.M.S.

N75-14761*# General Electric Co., Cincinnati, Ohio.
ACOUSTIC RESULTS FROM TESTS OF A 36-INCH (0.914 m) DIAMETER STATORLESS LIFT FAN
D. L. Stimpert Jun. 1973 114 p refs
(Contract NAS2-5462)
(NASA-CR-137621; R73AEG360) Avail: NTIS HC $5.25 CSCL 21E

A statorless, turbotip lift fan was tested statically outdoors to determine its acoustic characteristics. Spectral and directivity results are presented with comparison to data from the same family of lift fan designs having stator vanes. Modifications to the fan were tested to evaluate circular inlet guide vanes and exhaust treatment. A comparison was made of results obtained at General Electric Edwards Flight Test Center and NASA Ames Research Center with regards to test data and differences in site characteristics.
Author

N75-14762*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AEROACOUSTIC PERFORMANCE OF SCALE MODEL SONIC INLETS
John M. Abbott 1975 19 p refs Presented at 13th Aerospace Sci. Meeting Pasadena, Calif., 20-22 Jan. 1975; sponsored by the AIAA
(NASA-TM-X-71637; E-8184) Avail: NTIS HC $3.25 CSCL 01C

A low speed wind tunnel was used to evaluate the inflight aeroacoustic performance of several single- and multiple-passage sonic inlets. Takeoff and approach geometries were tested, and the effects of inlet lip and diffuser design were determined. Results indicate that the single passage geometries, in particular a cylindrical centerbody takeoff geometry and a bulb shaped centerbody approach geometry, provide the highest level of aeroacoustic performance. Increasing inlet lip contraction ratio extends the maximum incidence angle for attached lip flow, while increasing inlet diffuser length results in higher total pressure recovery for a given amount of noise suppression.
Author

N75-14763# Cranfield Inst. of Technology (England). Coll. of Aeronautics.
SUBSONIC JET TRANSPORT NOISE: THE RELATIVE IMPORTANCE OF VARIOUS PARAMETERS
D. Howe Jul. 1974 22 p refs
(Cranfield-Aero-25) Avail: NTIS HC $3.25

The area of the 80 PNdB noise footprint of subsonic jet transport aircraft was evaluated using a simple expression for powerplant noise level. The parameters varied were the bypass ratio, field strength, climb out and descent angle, installed thrust, standard of engine acoustic treatment, and the rate of noise attenuation. Curves are presented for typical ranges of the variables. It was concluded that the bypass ratio is the most important influence on the footprint area. The attenuation rate also has a very significant effect but it is outside the control of the designer. Field length has only a secondary effect on noise footprint.
Author

N75-14764*# Rao and Associates, Inc., Palo Alto, Calif.
THEORETICAL STUDIES ON TONE NOISE FROM A DUCTED FAN ROTOR
C. V. R. Rao, W. T. Chu, R. V. Digumarthi, and R. K. Agarwal Sep. 1974 69 p refs
(Contract NAS2-6401)
(NASA-CR-137620) Avail: NTIS HC $4.25 CSCL 20A

The method of computing radiated noise from a ducted rotor due to inflow distortion and turbulence are examined. Analytical investigations include an appropriate description of sources, the cut-off conditions imposed on the modal propagation of the pressure waves in the annular duct, and reflections at the upstream end of the duct. Far field sound pressure levels at blade passing frequency due to acoustic radiation from a small scale low speed fan are computed. Theoretical predictions are in reasonable agreement with experimental measurements.
Author

N75-14765*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ACOUSTIC AND AERODYNAMIC PERFORMANCE OF A 1.83 METER (6 FOOT) DIAMETER 1.2 PRESSURE RATIO FAN (QF-6)
Richard P. Woodward, James G. Lucas, and Edward G. Stakolich Washington Dec. 1974 117 p refs

(NASA-TN-D-7809; E-7996) Avail: NTIS HC $5.25 CSCL 21E

A 1.2-pressure-ratio, 1.83-meter-(6-ft-) diameter experimental fan stage with characteristics suitable for use in STOL aircraft engines was tested for acoustic and aerodynamic performance. The design incorporated features for low noise, including absence of inlet guide vanes, low rotor-blade-tip speed, low aerodynamic blade loading, and long axial spacing between the rotor and stator rows. The stage was run with four nozzles of different area. The perceived noise along a 152.4 meter (500-ft) sideline was rear-quadrant dominated with a maximum design-point level of 103.9 PNdb. The acoustic 1/3-octave results were analytically separated into broadband and pure-tone components. It was found that the stage noise levels generally increase with a decrease in nozzle area, with this increase observed primarily in the broadband noise component. A stall condition was documented acoustically with a 90-percent-of-design-area nozzle. Author

N75-14766*# McDonnell Aircraft Co., St. Louis, Mo.
EFFECTS OF SELECTED DESIGN VARIABLES ON THREE RAMP, EXTERNAL COMPRESSION INLET PERFORMANCE
James H. Kamman and Charles L. Hall Washington NASA Jan. 1975 281 p refs
(Contract NAS2-7012)
(NASA-CR-2485) Avail: NTIS HC $8.75 CSCL 21E

Two inlet performance tests and one inlet/airframe drag test were conducted in 1969 at the NASA-Ames Research Center. The basic inlet system was two-dimensional, three ramp (overhead), external compression, with variable capture area. The data from these tests were analyzed to show the effects of selected design variables on the performance of this type of inlet system. The inlet design variables investigated include inlet bleed, bypass, operating mass flow ratio, inlet geometry, and variable capture area. Author

N75-14767*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AERODYNAMIC PERFORMANCE OF 0.5 METER-DIAMETER, 337 METER-PER-SECOND-STAGE FAN DESIGNED FOR LOW NOISE AIRCRAFT ENGINES
Thomas F. Gelder and George W. Lewis, Jr. Washington Dec. 1974 185 p refs
(NASA-TN-D-7836; E-7779) Avail: NTIS HC $7.00 CSCL 21E

Overall and blade-element aerodynamic performance of a 0.271-scale model of QF-1 are presented, examined, and then compared and evaluated with that from similar low noise fan stage designs. The tests cover a wide range of speeds and weight flows along with variations in stator setting angle and stator axial spacing from the rotor. At design speed with stator at design setting angle and a fixed distance between stage measuring stations, there were no significant effects of increasing the axial spacing between rotor stator from 1.0 to 3.5 rotor chords on stage overall pressure ratio, efficiency or stall margin. Author

N75-14768# Massachusetts Inst. of Tech., Cambridge. Gas Turbine Lab.
STUDIES ON TRANSONIC TURBINES WITH FILM COOLED BLADES Annual Technical Report, 1 Jul. 1973 - 30 Jun. 1974
O. M. Amana, H. O. Demuren, and J. F. Louis Jun. 1974 60 p refs
(Contract N00014-67-A-0204-0079; NR Proj. 094-370)
(AD-786739; TR-74-1) Avail: NTIS CSCL 21/5

The goal of these studies has been to gather the necessary heat transfer data and develop the design procedure for high performance, film cooled, highly loaded transonic turbine stages. In the pursuit of this goal, three key tasks were accomplished: the measurement of heat transfer rates and film effectiveness in the low supersonic range, a study of the flow at the trailing edge of transonic turbine blades and the heat transfer at this critical part of the blade, and a determination of an optimum profile for a turbine stage providing high work per unit of cooled blade surface. GRA

N75-14769# Naval Postgraduate School, Monterey, Calif.
FLOW CHARACTERISTICS IN SOLID FUEL RAMJETS Interim Report, 1 Dec. 1973 - 1 Jul. 1974
Joseph T. Phaneuf, Jr. and David W. Netzer Jul. 1974 59 p refs
(AD-786692; NPS-57NT74081) Avail: NTIS CSCL 21/5

An experimental investigation of the internal ballistics of solid fuel ramjets was conducted in order to determine the effects of inlet step size, inlet velocity and wall blowing on flow characteristics behind a backward facing step inlet. It was shown that the reattachment point (zone) moves toward the step inlet with wall mass addition at a constant inlet mass flux. For a given step inlet, however, the leading edge of the reattachment zone was stationary with variations in inlet velocity. A point where the wall temperature and centerline static pressure profiles leveled off simultaneously was defined as the end of the reattachment zone. This zone spread out (grew thicker) both with increasing inlet velocity for a given step size, and with increasing step height. Maximum wall temperatures occurred downstream of the reattachment zone. Author (GRA)

N75-14770# Army Air Mobility Research and Development Lab., Fort Eustis, Va.
HIGH SPEED ROTOR DYNAMICS: AN ASSESSMENT OF CURRENT TECHNOLOGY FOR SMALL TURBOSHAFT ENGINES
John M. Vance Jul. 1974 50 p refs
(DA Proj. 1G1-62207-AA-72)
(AD-787319; USAAMRDL-TR-74-6616) Avail: NTIS CSCL 21/5

Problem areas connected with rotor dynamics which are peculiar to the special requirements of rotor-bearing systems in the class of small turboshaft engines being developed for U.S. Army helicopters are identified. The present and past philosophy of design is discussed, including the impact of the demand for front drives. Methods for critical speed prediction and high-speed balancing are reviewed. The trend to higher speeds is seen to require consideration of new approaches to balancing through flexural modes. The major parameters available for control by the designer are shown to be the bearing support properties, and recommendations are made for improving the accuracy of prediction of these properties. Modified author abstract (GRA)

N75-14771# Ultrasystems, Inc., Phoenix, Ariz. Dynamic Science Div.
FUEL SYSTEM RELIABILITY AND MAINTAINABILITY INVESTIGATION, VOLUME 1 Final Report May 1973 - May 1974
Neva B. Johnson Jul. 1974 90 p refs
(Contract DAAJ02-73-C-0072; DA Proj. 1F1-62205-A-11903)
(AD-786563; Dyn-Sci-1560-74-12-Vol-1; USAAMRDL-TR-74-51A) Avail: NTIS CSCL 01/3

Developmental and operational experience and applicable specifications, handbooks, and technical reports pertaining to current U.S. Army helicopter fuel systems were analyzed to determine deficiencies in the existing documentation as it relates to Army helicopter fuel system reliability and maintainability. Justifiable revisions to applicable military specifications were proposed. The revisions and newly established requirements, along with other viable alternatives which were considered, are discussed, and the rationale behind the final selections is presented. Volume II, containing all revisions and the two complete draft specifications, can be appended to or referenced by Government and/or industry specifications. (Modified author abstract) GRA

N75-14772# Ultrasystems, Inc., Phoenix, Ariz. Dynamic Science Div.
FUEL SYSTEM RELIABILITY AND MAINTAINABILITY INVESTIGATION. VOLUME 2: SUPPLEMENTAL DESIGN GUIDE Final Report, May 1973 - May 1974
Neva B. Johnson Jul. 1974 111 p
(Contract DAAJ02-73-C-0072; DA Proj. 1F1-62205-A-11903)
(AD-786564; Dyn-Sci-1560-74-12A-Vol-2; USAAMRDL-TR-74-51B) Avail: NTIS CSCL 01/3

The volume contains a list of documents, including applicable military specifications, that should be considered in the design of helicopter fuel systems. Recommended specification revisions

and newly established requirements in the form of two complete draft specifications are also included. Author (GRA)

N75-14775 National Aeronautical Establishment, Ottawa (Ontario). Div. of Mechanical Engineering.
AEROTHERMODYNAMIC FACTORS GOVERNING THE RESPONSE RATE OF GAS TURBINES
B. D. MacIsaac and H. I. H. Saravanamuttoo (Carleton Univ.) *In its* Sigma Phase Formation in High Temp. Alloys and Response Rate of Gas Turbines 30 Sep. 1974 p 23-71 refs Presented at the AGARD Propulsion and Energetics Panel 44th Meeting on Power Plant Control for Aero Gas Turbine Eng., Ankara, Sep. 1974 (For availability see N75-14773 06-09)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

No abstracts in this category.

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N75-14773# National Aeronautical Establishment, Ottawa (Ontario).
[SIGMA PHASE FORMATION IN HIGH TEMPERATURE ALLOYS AND RESPONSE RATE OF GAS TURBINES] Quarterly Bulletin, 1 Jul. - 30 Sep. 1974
30 Sep. 1974 70 p refs
(DME/NAE-1974(3)) Avail: NTIS HC $4.25

Methods used to predict sigma phase formation in high temperature alloys are reviewed. Constraints on gas turbine response rates are also considered, resulting from aerothermodynamic factors. For individual titles, see N75-14774 through N75-14775.

N75-14774 National Aeronautical Establishment, Ottawa (Ontario). Structures and Materials Lab.
PREDICTION OF SIGMA PHASE FORMATION IN HIGH TEMPERATURE ALLOYS **c26**
W. Wallace *In its* Sigma Phase Formation in High Temp. Alloys and Response Rate of Gas Turbines 30 Sep. 1974 p 1-21 refs (For availability see N75-14773 06-09)

The method of Barrows and Newkirk was used to calculate the critical electron-vacancy numbers of a wide range of gamma-matrix compositions determined either experimentally or by a computational procedure. These predictions of sigma phase susceptibility are compared with predictions resulting from a modified procedure. Author

N75-14775 National Aeronautical Establishment, Ottawa (Ontario). Div. of Mechanical Engineering.
AEROTHERMODYNAMIC FACTORS GOVERNING THE RESPONSE RATE OF GAS TURBINES **c07**
B. D. MacIsaac and H. I. H. Saravanamuttoo (Carleton Univ.) *In its* Sigma Phase Formation in High Temp. Alloys and Response Rate of Gas Turbines 30 Sep. 1974 p 23-71 refs Presented at the AGARD Propulsion and Energetics Panel 44th Meeting on Power Plant Control for Aero Gas Turbine Eng., Ankara, Sep. 1974 (For availability see N75-14773 06-09)

Constraints are reviewed on gas turbine response rates resulting from aerothermodynamic considerations and the use of variable geometry to improve the response rate. Mathematical models, which have to be verified experimentally, permit a detailed investigation of engine transient response. The transient behavior of single spool unit is quite different from that of a twin spool unit and techniques of improving the response rate of both are discussed; significant gains can be realized and the use of simulation techniques permits these to be evaluated before carrying out actual engine tests. Author

N75-14776*# Atlantic Research Corp., Alexandria, Va. EMM Dept.
DEVELOPMENT AND MODIFICATION OF A DIGITAL PROGRAM FOR FINAL APPROACH TO LANDING
William G. Duff and Charles R. Guarino [1974] 125 p refs (Contract NAS1-11992)
(NASA-CR-132562) Avail: NTIS HC $5.25 CSCL 01E

The development and implementation of a dynamic digital computer simulator which may be used to evaluate aircraft performance when operating under the control and guidance of various navigation, landing, and flight control systems are discussed. The digital computer program may be used to simulate and evaluate the relationships and interactions between various factors such as the microwave landing system, avionics receivers and onboard processors, aircraft aerodynamics, aircraft automatic control systems, control surfaces, and wind and other external effects. The models used to represent aircraft aerodynamics, control system and control surfaces; weather and wind effects; and the microwave landing system are described. Example results are presented for a simulation of a Boeing 737 using two sample control systems while subjected to various atmospheric conditions and microwave landing system errors. The limitations and performance capabilities of these control systems are discussed in terms of their ability to utilize the microwave landing system signal. Author

N75-14777*# Airborne Instruments Lab., Deer Park, N.Y.
SIGNAL SIMULATOR MODEL A-111 Final Report
T. Flattau and J. Mellars Jul. 1974 18 p
(Contract NAS5-23211)
(NASA-CR-139170; A111-1) Avail: NTIS HC $3.25 CSCL 14B

A signal simulator designed to function as a signal source for Doppler tracking high data rate receivers is described. The simulator produces modulated signals whose carrier frequency can be varied between 200 and 900 MHz at rates greater than 20 MHz/sec. The modulation is phase shift keying with data rate up to 300 megabits per second. Author

N75-14778*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COMPARATIVE EVALUATION OF PREDICTED AND MEASURED PERFORMANCE OF A 68-CUBIC METER TRUNCATED REVERBERANT NOISE CHAMBER
H. D. Cyphers, A. N. Munson, and F. J. On Washington Jan. 1975 48 p refs
(NASA-TN-D-7755; G-7434) Avail: NTIS HC $3.75 CSCL 14B

The performance of a medium size, truncated reverberation chamber is evaluated in detail. Chamber performance parameters are predicted, using classical acoustic theory, and are compared to results from actual chamber measurements. Discrepancies are discussed in relation to several available empirical corrections developed by other researchers. Of more practical interest is the confirmation of a recent theory stating that the present guide for the ratio of specimen volume to test chamber volume, approximately 10 percent, is overly conservative, and can be increased by a factor of at least 2 and possibly 3. Results and theoretical justification of these findings are presented. Author

N75-14779# National Research Council of Canada, Ottawa (Ontario).
FLUIDIZED BED APPARATUS DIVIDED INTO SECTIONS BY GRID TRAYS
I. G. Martyushin and V. N. Golovin 1974 15 p ref Transl. into ENGLISH from Tr. Mosk. Inst. Khim. Mashinostr., (USSR), v. 26, 1964 p 23-32
(NRC-TT-1777) Avail: NTIS HC $3.25

The performance of three and four compartment columns of

laboratory type grid trays was investigated along with certain phenomena observed in fluidized systems with grid trays. A method based on flooding a two compartment apparatus was developed to study the dependency of solids flow on various factors. The total flow of solids was determined to be a function of various parameters: (1) the gas velocity; (2) the height of the bed; (3) the properties of solid materials; and (4) the characteristics of the tray. The main parameters of columns with fluidized beds divided into compartments by grid trays were determined.
J.M.S.

N75-14780*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NASA LEWIS 10 BY 10 FOOT SUPERSONIC WIND TUNNEL
Robert A. Aiello Nov. 1974 47 p
(NASA-TM-X-71625; E-8151) Avail: NTIS HC $3.75 CSCL 01E

Performance data are presented for this tunnel, which has a Mach number range from 2.0 to 3.5. The tunnel circuit, model support systems, auxiliary systems, instrumentation, control room equipment, and automatic recording and computing equipment are described. Information is presented on criteria for designing models, and on shop facilities available to users. Author

N75-14781*# General Electric Co., Philadelphia, Pa. Space Sciences Lab.
DESIGN ANALYSIS OF LEVITATION FACILITY FOR SPACE PROCESSING APPLICATIONS Final Report
R. T. Frost, W. P. Kornrumpf, L. J. Napaluch, J. D. Harden, Jr., J. P. Walden, E. H. Stockhoff, G. Wouch, and L. H. Walker 15 Nov. 1974 128 p
(Contract NAS8-29680)
(NASA-CR-120595) Avail: NTIS HC $5.75 CSCL 14B

Containerless processing facilities for the space laboratory and space shuttle are defined. Materials process examples representative of the most severe requirements for the facility in terms of electrical power, radio frequency equipment, and the use of an auxiliary electron beam heater were used to discuss matters having the greatest effect upon the space shuttle pallet payload interfaces and envelopes. Improved weight, volume, and efficiency estimates for the RF generating equipment were derived. Results are particularly significant because of the reduced requirements for heat rejection from electrical equipment, one of the principal envelope problems for shuttle pallet payloads. It is shown that although experiments on containerless melting of high temperature refractory materials make it desirable to consider the highest peak powers which can be made available on the pallet, total energy requirements are kept relatively low by the very fast processing times typical of containerless experiments and allows consideration of heat rejection capabilities lower than peak power demand if energy storage in system heat capacitances is considered. Batteries are considered to avoid a requirement for fuel cells capable of furnishing this brief peak power demand. Author

N75-14782# Sandia Labs., Albuquerque, N.Mex.
SHOCK LABORATORY DATA SYSTEM
D. R. Porter Jul. 1974 97 p refs
(Contract AT(29-1)-789)
(SLA-74-0115) Avail: NTIS HC $4.75

The shock laboratory data system at Sandia Laboratories is a minicomputer based data gathering system designed to take accelerometer data, condition and digitize it, and store the real time information for either a quick look or a more detailed analysis. Capabilities include: shock spectrum, Fourier analysis, and transfer of data in compatible format on digital magnetic tape to a CDC-6600 computer for a more detailed analysis. This report provides a general overview of system capabilities, specifics as applied to system design, development and hardware makeup, and standard operating procedures. Author (NSA)

N75-14783# Office of Naval Research, London (England).
TWO ELECTRONICS RESEARCH ESTABLISHMENTS IN THE USSR
A. H. Waynick 19 Jun. 1974 13 p
(AD-786364; ONRL-R-6-74) Avail: NTIS CSCL 14/2

A report is made on visits to several electronics facilities and research institutes in the U.S.S.R. as a component of the cultural and scientific exchange program between the US and the Soviet Union. The IEEE and the Popov Society were the technical institutions involved. An attempt is made to provide an overview of portions of the programs of the Institute of Radio Engineering and Electronics of the Academy of Sciences of the U.S.S.R., Moscow, and of the Institute of Semiconductor Physics, Academy of Sciences of the U.S.S.R., Siberian Branch, Akademgorodok. Author (GRA)

N75-14784# Naval Underwater Systems Center, New London, Conn.
INSTALLATION OF A RECTANGULAR TEST SECTION FOR ACOUSTIC WATER TUNNEL STUDIES OF FLOW-INDUCED NOISE
Howard H. Schloemer 21 Aug. 1974 61 p refs
(NUSC Proj. A-150-05; ZR0000101)
(AD-786693; NUSC-TR-4763) Avail: NTIS CSCL 20/1

A second leg was added to an existing pump driven, continuous flow, closed loop acoustic water tunnel to provide a capability for measuring flow-induced noise effects and the effects of surface roughness, protuberances, depressions, and pressure gradients on turbulent boundary layer wall-pressure fluctuations. The leg consists of a rectangular test section 4 inches high at the entrance and 4.5 inches high at the exit, with a constant width of 12 inches over a length of 90 inches. The report describes the design and construction of the new section and related components and the results of hydrodynamic and acoustic measurements. (Modified author abstract) GRA

N75-14785# Air Force Human Resources Lab., Brooks AFB, Tex.
USE OF THE T-4G SIMULATOR IN USAF UNDERGRADUATE PILOT TRAINING (UPT), PHASE 1 Final Report
Robert R. Woodruff, James F. Smith, and Robert A. Morris Jul. 1974 41 p refs
(AF Proj. 1123)
(AD-786413; AFHRL-TR-74-61) Avail: NTIS CSCL 14/2

The A/F37A/T-4G, a T-37 flight training simulator with limited visual and motion capability, was evaluated to determine the extent to which its technology could be used to substitute for flying hours in the UPT T-37 syllabus. S special syllabus maximizing T-4G capabilities was used. This report describes the first phase in which six UPT students were trained in the T-4G/T-37 program. The six students completed contact training in 23.4 flying hours (a savings of 3.8 hours), and they completed instrument training in 9.7 flying hours (a savings of 11.1 hours). Author (GRA)

N75-14786# Army Electronics Command, Fort Monmouth, N.J.
ANNUAL REENTRY VEHICLE JAMMING SIMULATOR STATUS REPORT
Fred B. Lowery 1 Jul. 1970 36 p
(AD-786927; ECOM-5323) Avail: NTIS CSCL 17/4

The Re-entry Vehicle Jamming Simulator development has progressed through the first, second, and third level block diagrams. More detailed designs have also been accomplished in some areas. The functional requirements and basic operation of the RVJS have been established and an interface of the RVJS to the SAFEGUARD Missile Site Radar has been proposed. Plans for developing a prototype RVJS are to divide the system into four subsystems for separate contracts. The technical data package for procurement of the first subsystem has been completed and is being reviewed. In addition, work has been initiated for procurement of the second subsystem. Plans for acceptance testing of the subsystems have been briefly outlined. The subsystem interfacing will be accomplished in-house by SAFVIT. The RVHS will provide a realistic simulation of a hostile environment to the SAFEGUARD radars. Author (GRA)

N75-14787# Physics International Co., San Leandro, Calif.
FEASIBILITY STUDY OF EXPLOSIVELY DRIVEN HYPERVELOCITY PROJECTILES Final Report, 1 Jun. 1973 - 1 Jan. 1974
K. Seifert Apr. 1974 167 p refs
(Contract DAAK02-73-C-0396)
(AD-785578; PIFR-559) Avail: NTIS CSCL 14/2

The program performed was a feasibility study to evaluate

the possibility of developing an explosive driver hypervelocity launcher capable of launching simultaneously many small projectiles to velocities of 10 km/sec. Any feasible launcher developed must be capable of being incorporated into a weapon system. To design a launcher system effectively, its ultimate usage must be kept in mind: generation of rear surface spall on armored vehicle targets. The following subsections present background information concerning the constraints placed on the launcher, rear surface spall phenomena, and the explosive driver concept. GRA

N75-14788# Tactical Air Command, Langley AFB, Va. Directorate Force Development and Analysis.
CONCEPT OF OPERATIONS FOR A FULL MISSION FIGHTER SIMULATOR (FMFS)
10 Sep. 1974 9 p
(AD-785901) Avail: NTIS CSCL 01/3

This document sets forth the concept of operations of a full mission fighter simulator which provides visual and radar simulation for supplemental training in air-to-air, air-to-ground, formation/refueling and ECM/ECCM mission profiles.
Author (GRA)

N75-14789# Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
A BUOYANCY-PROPELLED-TEST-BODY LABORATORY FACILITY Final Report, May 1966 - Feb. 1974
John M. Killen Jun. 1974 35 p refs
(Contract N00014-67-A-0113-0003; NR Proj. 062-388)
(AD-785872; Rept-149) Avail: NTIS CSCL 14/2

The physical form of a buoyancy-propelled-test-body facility and some preliminary test results are described. The facility is a 26-meter-high, 1.067-meter-diameter standpipe which can be filled with water or other liquid. An axisymmetric body rises by buoyancy and is guided up the center on a taut restraining cable. Sensors for measurement of velocity and displacement are incorporated into the guide cable. The standpipe is also equipped to provide pull-down and release of the test body, initial acceleration, and stopping. The confined space of a standpipe within the laboratory permits controlled use of drag reducing polymer in the test liquid and nucleus removal to reduce cavitation. (Modified author abstract) GRA

N75-15366 Academy of Sciences (USSR), Moscow.
SYNTHESIS OF A MANAGING INSTALLATION FOR PRODUCTIVE COMPLEXES, BASED ON THE THEORY OF SAMPLE DISCERNMENT
I. Sh. Torgovitskiy and M. S. Kogan *In its* Probl. of Cybernetics 1974 p 187-195 refs In RUSSIAN (For availability see N75-15338 06-63)
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12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N75-14790*# Southwest Research Inst., San Antonio, Tex.
FLUID PHYSICS, THERMODYNAMICS, AND HEAT TRANSFER EXPERIMENTS IN SPACE Final Report of the Overstudy Committee
Franklin T. Dodge, H. Norman Abramson, Stanley W. Angrist, Ivan Catton, Stuart W. Churchill, Richard J. Mannheimer, Simon Otrach, Sidney H. Schwartz, and Jan V. Sengers Jan. 1975 80 p refs
(Contract NAS3-17808)
(NASA-CR-134742; SwRI-02-3904) Avail: NTIS HC $4.75 CSCL 22A

An overstudy committee was formed to study and recommend fundamental experiments in fluid physics, thermodynamics, and heat transfer for experimentation in orbit, using the space shuttle system and a space laboratory. The space environment, particularly the low-gravity condition, is an indispensable requirement for all the recommended experiments. The experiments fell broadly into five groups: critical-point thermophysical phenomena, fluid surface dynamics and capillarity, convection at reduced gravity, non-heated multiphase mixtures, and multiphase heat transfer. The Committee attempted to assess the effects of g-jitter and other perturbations of the gravitational field on the conduct of the experiments. A series of ground-based experiments are recommended to define some of the phenomena and to develop reliable instrumentation. Author

N75-14791*# United Aircraft Corp., East Hartford, Conn. Research Labs.
PROCESSING EUTECTICS IN SPACE Interim Report
F. C. Douglas and F. S. Galasso Dec. 1974 32 p refs
(Contract NAS8-29669)
(NASA-CR-120569; N911721-S/A2-4) Avail: NTIS HC $3.75 CSCL 22A

Experimental work is reported which was directed toward obtaining interface shape control while a numerical thermal analysis program was being made operational. An experimental system was developed in which the solid-liquid interface in a directionally solidified aluminum-nickel eutectic could be made either concave to the melt or convex to the melt. This experimental system provides control over the solid-liquid interface shape and can be used to study the effect of such control on the microstructure. The SINDA thermal analysis program, obtained from Marshall Space Flight Center, was used to evaluate experimental directional solidification systems for the aluminum-nickel and the aluminum-copper eutectics. This program was applied to a three-dimensional ingot, and was used to calculate the thermal profiles in axisymmetric heat flow. The results show that solid-liquid interface shape control can be attained with physically realizable thermal configurations and the magnitudes of the required thermal inputs were indicated. Author

N75-14792*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE 1975 REPORT ON ACTIVE AND PLANNED SPACECRAFT AND EXPERIMENTS
Richard Horowitz, ed. and Leo R. Davis, ed. Jan. 1975 314 p
(NASA-TM-X-72539; NSSDC/WDC-A-R/S-75-01) Avail: NTIS HC $9.25 CSCL 22A

Information is presented on current and planned spacecraft activity for various disciplines: astronomy, earth sciences, meteorology, planetary sciences, aeronomy, solar physics, and life sciences. For active orbiting spacecraft, the epoch date, orbit type, orbit period, apoasis, periapsis, and inclination are given along with the spacecraft weight, launch date, launch site, launch vehicle, and sponsoring agency. For each planned orbiting spacecraft, the orbit parameters, planned launch date, launch site, launch vehicle, spacecraft weight, and sponsoring agency are given. F.O.S.

N75-14793*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
PRELIMINARY ANALYSIS OF SKYLAB RADSCAT RESULTS OVER THE OCEAN
R. K. Moore, J. D. Claassen, J. D. Young, W. J. Pierson, Jr. (City Univ. of New York), and V. J. Cardone (City Univ. of New York) Nov. 1974 9 p refs
(Contract NAS9-13642)
(NASA-CR-141454; RSL-TR-254-2; CUNY-43) Avail: NTIS HC $3.25 CSCL 22A

Preliminary observations at 13.9 GHz of the radar backscatter and microwave emission from the sea were analyzed using data obtained by the radiometer scatterometer on Skylab. Results indicate approximately a square-law relationship between differential scattering coefficient and windspeed at angles of 40 deg to 50 deg, after correction for directional effect, over a range from about 4 up to about 25 meters/sec. The brightness temperature response was also observed, and considerable success was achieved in correcting it for atmospheric attenuation and emission. Measurements were made in June, 1973, over Hurricane Ava off the west coast of Mexico and over relatively calm conditions in the Gulf of Mexico and Caribbean Sea.
Author

N75-14794*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SCOUT LAUNCH VEHICLE, PHASES 4 AND 5 Final Report

Donald C. McCracken, Abraham Leiss, Edith R. Horrocks, and Nell H. Turpen Nov. 1974 861 p
(NASA-TM-X-72628) Avail: NTIS HC $19.25 CSCL 22C

The historical data of the Scout launch vehicle program for Phases IV and V (vehicles 138 through 177) is presented for the FY 1966 through FY 1971 time period. Technical data and accounting information are detailed to provide a total picture of the program. Author

N75-14795*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SPACE INVESTIGATIONS DOCUMENTATION SYSTEM (SIDS) REPORT
Dec. 1974 165 p
(NASA-TM-X-72537; NSSDC-74-16) Avail: NTIS HC $6.25 CSCL 22C

Descriptions of past and future flight experiments are provided, along with information regarding the spacecraft and the principal investigator. N.E.R.

N75-14796*# Calspan Corp., Buffalo, N.Y.
STUDY OF THE DETAIL CONTENT OF APOLLO ORBITAL PHOTOGRAPHY Final Report
R. E. Kinzly 15 Aug. 1974 120 p refs
(Contract NASw-2434)
(NASA-CR-141318; YB-5224-M-1) Avail: NTIS HC $5.25 CSCL 22C

The development and application of image evaluation methods for assessing the detail content of Apollo orbital photography was demonstrated. Edge analysis using shadow to sunlight edges interior to craters was successfully used to evaluate the fine detail content of Apollo 15, 16, and 17 imagery. A method for evaluating tone quality was developed using a gain factor as a function of object contrast and average exposure level that can be related to object detectability. Author

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N75-14797*# Tennessee Univ. Space Inst., Tullahoma.
THE ITERATIVE SOLUTION OF THE PROBLEM OF ORBIT DETERMINATION USING CHEBYSHEV SERIES Final Technical Report, 1 Jan. 1974 - 31 Jan. 1975
Terry Feagin 31 Jan. 1975 24 p refs
(Grant NGR-43-001-144)
(NASA-CR-141317) Avail: NTIS HC $3.25 CSCL 22A

A method of orbit determination is investigated which employs Picard iteration and Chebyshev series. The method is applied to the problem of determining the orbit of an earth satellite from range and range-rate observations contaminated by noise. It is shown to be readily applicable and to possess linear convergence. Author

N75-14798*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MSFC SKYLAB EXTRAVEHICULAR ACTIVITY DEVELOPMENT REPORT
Richard T. Heckman Dec. 1974 132 p
(NASA-TM-X-64855) Avail: NTIS HC $5.75 CSCL 22C

The development activities are presented in a chronological order and cover the EVA hardware design from initial concept to final flight configuration. Major concepts which were considered, and the criteria for design are identified. The reasons for the acceptance or rejection of these concepts are discussed. The report concludes that developmental protocol of interleaving analyses and simulations on an iterative basis provided a conservative, flexible and simple EVA system, which was effective not only for the nominal Skylab mission but for many contingency activities as well. Author

N75-14799*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MISSION STRATEGY FOR COMETARY EXPLORATION IN THE 1980'S
Robert W. Farquhar Nov. 1974 31 p refs Presented at IAU Colloq. No. 25 The Study of Comets, Greenbelt, Md., 28 Oct. - 1 Nov. 1974
(NASA-TM-X-70804; X-581-74-337) Avail: NTIS HC $3.75 CSCL 22A

A sequence of ballistic intercept missions to comets is proposed. The mission set is composed of a well-known group of periodic comets whose physical properties are dissimilar. In addition to full descriptions of the nominal mission profiles, earth-based sighting conditions and estimates of cometary ephemeris errors are presented for each target comet. The first mission of the sequence is a slow flyby (approximately 8 km/sec) of Encke's comet near its perihelion in 1980. Because of a near resonance in the orbital periods of Encke and the spacecraft, it is possible to retarget the spacecraft for a second Encke encounter in 1984. The second mission of the sequence also consists of two cometary encounters but in this case different comets are involved; Giacobini-Zinner in 1985 and Borrelly in 1987. The final mission of the sequence calls for a simultaneous launch of two spacecraft towards Halley's comet in 1985. One spacecraft is targeted fo a pre-perihelion intercept at a heliocentric distance of 1.37 AU. Author

N75-14800*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EFFECT OF RESONANCE-OBLATENESS COUPLING ON A SATELLITE ORBIT
Carl A. Wagner Nov. 1974 29 p refs Submitted for publication
(NASA-TM-X-70800; X-920-74-334) Avail: NTIS HC $3.75 CSCL 22C

Second order effects of the coupling between geopotential resonance and oblateness on a satellite orbit are calculated. Results show that: (1) these effects arise from the interaction of resonance with the secular changes of the orbit's node, perigee, and mean anomaly; (2) they have the same period and phase as first order resonance perturbations; and (3) their amplitudes are proportional to the square of the period and dominate the first order effects as the orbit becomes commensurate. A striking example of this coupling is seen in the 18 day resonance variation of the node of the orbit of the first earth resources technology satellite. Analysis of this one arc second (31m) variation yielded a strong 14th order constraint to the geopotential for odd degree terms. This constraint is poorly predicted by current models. Author

N75-14801*# Martin Marietta Corp., Denver, Colo.
A FEASIBILITY STUDY OF UNMANNED RENDEZVOUS AND DOCKING IN MARS ORBIT. VOLUME 1: SUMMARY
Jul. 1974 72 p refs Prepared for JPL
(Contracts NAS7-100; JPL-953746)
(NASA-CR-141358; MCR-74-244-Vol-1) Avail: NTIS HC $4.25 CSCL 22A

The technical feasibility of achieving automatic rendezvous and docking in Mars orbit as a part of a surface sample return mission was investigated based on using as much existing Viking '75 Orbiter and Lander hardware as possible. Both 1981 and 1983/84 mission opportunities were considered. The principle result of the study was the definition of a three stage 289 kg Mars Ascent Vehicle (MAV) capable of accepting a 1 kg sample, injecting itself into a 2200 km circular orbit, and rendezvousing with an orbiting spacecraft carrying an earth return vehicle. Conclusions are that with state of the art systems plus limited application of new developments in areas where feasibility has already been demonstrated, e.g., solid rocket motor sterilization, it is possible to land a small ascent vehicle capable of automatically ascending and rendezvousing with a modified Viking '75 orbiter spacecraft. The mission can be flown in 1981 or 1983/84, but a dual launch or a larger launch vehicle than the Viking Titan 3 Centaur, or the use of space storable propellants for Mars orbit injection, would be required in the 1983/84 opportunity. Author

N75-14802*# Martin Marietta Corp., Denver, Colo.
A FEASIBILITY STUDY OF UNMANNED RENDEZVOUS AND DOCKING IN MARS ORBIT. VOLUME 2: TECHNICAL STUDIES AND RESULTS Final Report, Nov. 1973 - Jun. 1974

Jul. 1974 463 p refs Prepared for JPL
(Contracts NAS7-100; JPL-953746)
(NASA-CR-141359; MCR-74-244-Vol-2) Avail: NTIS HC $11.50 CSCL 22A
For abstract, see N75-14801.

N75-14803# Technische Universitaet, Munich (West Germany). Inst. fuer Astronomische und Physikalische Geodaesie.
THEORY OF SATELLITE ORBITS, PART 4 [THEORIE DER SATELLITENBAHNEN 4]
Manfred Schneider 31 Jul. 1974 108 p In GERMAN; ENGLISH summary
(Contracts WRK-187; SFB-78)
(TUM-Mitt-115) Avail: NTIS HC $5.25

A literature review of solutions to orbital motion problems is presented. Simplified motion problems are discussed in order to obtain valid intermediate solutions regarding Kepler orbits for perturbation calculus. The main concern is central orbits. ESRO

N75-14804# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abteilung Flugbahnen.
ACTIVITIES OF THE INSTITUTE FOR FLIGHT SYSTEMS DYNAMICS IN THE FIELD OF FLIGHT ORBITS [DOKUMENTATION DER AKTIVITAETEN DES INSTITUTS FUER DYNAMIK DER FLUGSYSTEME AUF DEM GEBIET FLUGBAHNEN]
Ernst Dieter Dickmanns 31 May 1974 83 p refs In GERMAN; ENGLISH summary
(DLR-Mitt-74-22) Avail: NTIS HC $4.75; DFVLR, Porz, West Ger. 32 DM

Activities in the field of trajectory dynamics are detailed. The main objectives are trajectory design, optimization, and trajectory determination. Optimization methods and their numerical implementation are discussed. The design of trajectories is subdivided into designs for launch vehicles, reentry vehicles, and transfer orbits. Trajectory determination and perturbation are discussed for satellites, sondes, interplanetary spacecraft, and high altitude research rockets. ESRO

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

No abstracts in this category.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N75-14805*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APPLICATIONS TECHNOLOGY SATELLITE ATS-6 EXPERIMENT CHECKOUT AND CONTINUING SPACECRAFT EVALUATION REPORT
W. Moore and W. Prensky, ed. Dec. 1974 487 p
(NASA-TM-X-70812; X-460-74-340) Avail: NTIS HC $12.00 CSCL 22B

The activities of the ATS-6 spacecraft are reviewed. The following subsystems and experiments are summarized: (1) radio beacon experiments; (2) spacecraft attitude precision pointing and slewing adaptive control experiment; (3) satellite instruction television experiment; (4) thermal control subsystem; (5) spacecraft propulsion subsystem; (6) telemetry and control subsystem; (7) millimeter wave experiment; and (8) communications subsystem. The results of performance evaluation of its subsystems and experiments are presented. J.M.S.

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

No abstracts in this category.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

N75-14806*# North American Rockwell Corp., Downey, Calif. Space Div.
TRACKING AND DATA RELAY SATELLITE SYSTEM CONFIGURATION AND TRADEOFF STUDY, PART 1. VOLUME 1: SUMMARY VOLUME Final Report
Oct. 1972 110 p 7 Vol.
(Contract NAS5-21705)
(NASA-CR-139167; SD-72-SA-0133-1-Vol-1) Avail: NTIS HC $5.25 CSCL 17B

Study efforts directed at defining all TDRS system elements are summarized. Emphasis was placed on synthesis of a space segment design optimized to support low and medium data rate user spacecraft and launched with Delta 2914. A preliminary design of the satellite was developed and conceptual designs of the user spacecraft terminal and TDRS ground station were defined. As a result of the analyses and design effort it was determined that (1) a 3-axis-stabilized tracking and data relay satellite launched on a Delta 2914 provides telecommunications services considerably in excess of that required by the study statement; and (2) the design concept supports the needs of the space shuttle and has sufficient growth potential and flexibility to provide telecommunications services to high data rate users. Recommendations for further study are included. Author

N75-14807*# North American Rockwell Corp., Downey, Calif. Space Div.
TRACKING AND DATA RELAY SATELLITE SYSTEM CONFIGURATION AND TRADEOFF STUDY, PART 1. VOLUME 3: TELECOMMUNICATIONS SERVICE SYSTEM Final Report
Oct. 1972 283 p refs 7 Vol.
(Contract NAS5-21705)
(NASA-CR-139166; SD-72-SA-0133-3-Vol-3) Avail: NTIS HC $8.75 CSCL 17B

The results of the telecommunications subsystem analysis are presented. The relay system requirements and constraints, interference analysis, frequency selection, modulation and coding analysis, and the performance analysis of the relay sye tem are included. Author

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N75-14808*# New Technology, Inc., Huntsville, Ala.
STUDY OF PROVIDING OMNIDIRECTIONAL VIBRATION ISOLATION TO ENTIRE SPACE SHUTTLE PAYLOAD PACKAGES Final Report
C. S. Chang, G. D. Robinson, and D. E. Weber [1974] 146 p refs
(Contract NAS1-12290)
(NASA-CR-132550) Avail: NTIS HC $5.75 CSCL 22B

Techniques to provide omnidirectional vibration isolation for a space shuttle payload package were investigated via a reduced-scale model. Development, design, fabrication, assembly and test evaluation of a 0.125-scale isolation model are described. Final drawings for fabricated mechanical components are identified, and prints of all drawings are included. Author

N75-14809*# Chrysler Corp., New Orleans, La. Space Div.
INVESTIGATION OF SPACE SHUTTLE LAUNCH VEHICLE EXTERNAL TANK NOSE CONFIGURATION EFFECTS (MODEL 67-OTS) IN THE ROCKWELL INTERNATIONAL 7 BY 7 FOOT TRISONIC WIND TUNNEL (IA69)
Robert Mennell (Rockwell Intern. Corp., Los Angeles, Calif.) and Robert Rogge (Rockwell Intern. Corp., Los Angeles, Calif.) Nov. 1974 342 p
(Contract NAS9-13247)
(NASA-CR-134424; DMS-DR-2122) Avail: NTIS HC $9.50 CSCL 22B

Wind tunnel aerodynamic investigations were conducted on an 0.015-scale representation of the space shuttle launch configuration. The primary test objectives were to investigate shock wave formation and record the aerodynamic stability and control effects generated by a new external tank nose configuration (MCR 467) at a Mach number of 1.2. Schlieren photographs were taken at angles of attack of -4 deg, 0 deg, and 4 deg, beta = 0 deg with force and pressure data recorded over the alpha range of -4 deg equal to or less than alpha equal to or less than 4 deg at beta = + or - 4 deg. The launch configuration model, consisting of the VL70-000140A/B Orbiter, the VL78-000041B ET, and the VL77-000036A SRBs, was sting mounted on a 2.5-inch Task type internal balance entering through the ET base region. Wing, body, and base pressure lines for all orifices were routed internally through the model to the sting support system. Parametric variation consisted only of altering the ET nose configuration. Author

N75-14810*# Chrysler Corp., New Orleans, La. Space Div.
TRIPLE BALANCE TEST OF THE PRR BASELINE SPACE SHUTTLE CONFIGURATION ON A .004 SCALE MODEL OF THE MCR 0074 ORBITER CONFIGURATION IN THE MSFC 14 X 14 INCH TRISONIC WIND TUNNEL (TWT 570) [IA31F(B)], VOLUME 1
Paul E. Ramsey and Tommy C. Davis (Northrop Services, Inc., Huntsville, Ala.) Dec. 1974 752 p refs 2 Vol.
(Contract NAS9-13247)
(NASA-CR-134434; DMS-DR-2028-Vol-1) Avail: NTIS HC $17.25 CSCL 22B

A wind tunnel force and moment test of the space shuttle launch vehicle was conducted. The wind tunnel model utilized a triple balance such that component aerodynamics of the orbiter, external tank, and solid rocket booster was obtained. The test was conducted at an angle of attack range from -10 deg to 10 deg, and angle of sideslip range from -10 deg to 10 deg, and a Mach number range from 0.6 to 4.96. Simulation parameters to be used in future launch vehicle wind tunnel tests were investigated. The following were included: (1) effect of orbiter -ET attach hardware; (2) model attachment (spacer) effects; (3) effects of grit on model leading surfaces; and (4) model misalignment effects. The effects of external tank nose shape was studied by investigating five different nose configurations. Plotted and tabulated data is reported. Author

N75-14811*# Chrysler Corp., New Orleans, La. Space Div.
TRIPLE BALANCE TEST OF THE PRR BASELINE SPACE SHUTTLE CONFIGURATION ON A .004 SCALE MODEL OF THE MCR 0074 ORBITER CONFIGURATION IN THE MSFC 14 X 14 INCH TRISONIC WIND TUNNEL (TWT 570) [IA31F(B)], VOLUME 2
Paul E. Ramsey and Tommy C. Davis (Northrop Services, Inc., Huntsville, Ala.) Dec. 1974 684 p refs 2 Vol.
(Contract NAS9-13247)
(NASA-CR-134436; DMS-DR-2028-Vol-2) Avail: NTIS HC $15.25 CSCL 22B

For abstract see, N75-14810.

N75-14812*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SUPERSONIC DYNAMIC STABILITY DERIVATIVES OF A MODIFIED 089B SHUTTLE ORBITER
Delma C. Freeman, Richmond P. Boyden, and E. E. Davenport Oct. 1974 163 p refs
(NASA-TM-X-72630) Avail: NTIS HC $6.25 CSCL 22B

An experimental test program was conducted to measure the dynamic stability derivatives of a modified 089B shuttle orbiter. Supersonic forced oscillation tests were conducted in the Langley Unitary Plan Wind Tunnel over a range of Mach numbers from 1.6 to 4.63 for angles of attack up to 30 deg. The data were measured at the model resonant frequency with pitch and yaw amplitudes of 1 deg and a roll amplitude of 2.5 deg. Author

N75-14813*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
EXPERIMENTAL DETERMINATION OF THE PRINCIPAL MOMENTS OF INERTIA OF THE HELIOS PROTOTYPE SPACECRAFT
W. H. Gayman and K. Liechti 15 Nov. 1974 80 p
(Contract NAS7-100)
(NASA-CR-141315; JPL-TM-33-707) Avail: NTIS HC $4.75 CSCL 22B

The moment of inertia of the Helios Spacecraft about its spin axis was determined by use of a roll-fixture using two sets of crossed flexure pivots as elastic constraints. The test procedure entailed measurement of a system oscillation period with each of a set of added moment-of-inertia increments. The tare effect of the fixture was determined by a like process and was subtracted from the gross value to yield the spacecraft roll moment of inertia to an estimated accuracy of 0.2%. Lateral moments of inertia (i.e., about each of three axes normal to the spin axis) were determined by a gravity pendulum method that makes use of the fact that any physical pendulum has a minimum period of oscillation determined by a particular distance from the axis of rotation to the system center of gravity. Author

N75-14814*# Chrysler Corp., New Orleans, La. Space Div.
WIND TUNNEL TESTS OF AN 0.015-SCALE CONFIGURATION 140A/B SPACE SHUTTLE ORBITER MODEL (67-0) IN THE NASA/LRC 8-FOOT TPT TO OBTAIN TRANSONIC AERODYNAMIC FORCE DATA (OA106)
R. Burrows (Rockwell Intern. Corp., Downey, Calif.) Oct. 1974 197 p
(Contract NAS9-13247)
(NASA-CR-134426; DMS-DR-2120) Avail: NTIS HC $7.00 CSCL 22B

These tests were conducted to obtain longitudinal stability and control data for Mach numbers from 0.35 to 1.2. Data were obtained for an alpha range of -2 deg to +22 deg at beta = 0 deg. The effect of speedbrake deflection and body flap deflection was obtained through the Mach range. Boundary layer transition strips were used on the model. Author

N75-14815*# Grumman Aerospace Corp., Bethpage, N.Y.
ANALYTICAL AND EXPERIMENTAL STUDY OF THE EFFECTS OF WING-BODY AERODYNAMIC INTERACTION ON SPACE SHUTTLE SUBSONIC FLUTTER Final Report
Richard R. Chipman and Frank J. Rauch Washington NASA Jan. 1975 75 p
(Contract NAS1-10635)
(NASA-CR-2488) Avail: NTIS HC $4.25 CSCL 22B

The effects on flutter of the aerodynamic interaction between the space shuttle bodies and wing, 1/80th-scale semispan models of the orbiter wing, the complete shuttle and intermediate component combinations were tested in the NASA Langley Research Center 26-inch Transonic Blowdown Wind Tunnel. Using the double lattice method combined with slender body theory to calculate unsteady aerodynamic forces, subsonic flutter speeds were computed for comparison. Using calculated complete vehicle modes, flutter speed trends were computed for the full scale vehicle at an altitude of 15,200 meters and a Mach number of 0.6. Consistent with findings of the model studies, analysis shows the shuttle to have the same flutter speed as an isolated cantilevered wing. Author

N75-14816*# Martin Marietta Aerospace, Denver, Colo.
PAYLOAD/ORBITER CONTAMINATION CONTROL REQUIREMENT STUDY, VOLUME 1, EXHIBIT A Final Report
L. E. Bareiss, V. W. Hooper, R. O. Rantanen, and E. B. Ress
27 Dec. 1974 224 p refs
(Contract NAS8-30755)
(NASA-CR-120571; MCR-74-474-Vol-1) Avail: NTIS HC $7.25 CSCL 22B

This study is to identify and quantify the expected molecular and particulate on orbit contaminant environment for selected shuttle payloads as a result of major spacelab and shuttle orbiter contaminant sources. This investigation reviews individual payload susceptibilities to contamination, identifies the combined induced environment, identifies the risk of spacelab/payload critical surface(s) degradation, and provides preliminary contamination recommendations. It also establishes limiting factors which may depend upon operational activities associated with the payloads, spacelab, and the shuttle orbiter interface or upon independent payload functional activities. Author

N75-14817*# Martin Marietta Aerospace, Denver, Colo.
PAYLOAD/ORBITER CONTAMINATION CONTROL REQUIREMENT STUDY, VOLUME 2, EXHIBIT A
L. E. Bareiss, V. W. Hooper, R. O. Rantanen, and E. B. Ress
27 Dec. 1974 216 p refs
(Contract NAS8-30755)
(NASA-CR-120572; MCR-74-474-Vol-2) Avail: NTIS HC $7.25 CSCL 22B

The computer printout data generated during the Payload/Orbiter Contamination Control Requirement Study are presented. The computer listings of the input surface data matrices, the viewfactor data matrices, and the geometric relationship data matrices for the three orbiter/spacelab configurations analyzed in this study are given. These configurations have been broken up into the geometrical surfaces and nodes necessary to define the principal critical surfaces whether they are contaminant sources, experimental surfaces, or operational surfaces. A numbering scheme was established based upon nodal numbers that relates the various spacelab surfaces to a specific surface material or function. This numbering system was developed for the spacelab configurations such that future extension to a surface mapping capability could be developed as required. Author

N75-14818*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A DEPLOYABLE FLEXIBLE TUNNEL Patent Application
Newton D. Brown (Goodyear Aerospace Corp., Akron, Ohio), Gordon L. Jeppesen (Goodyear Aerospace Corp., Akron, Ohio), and Nicholas C. Costakos, inventors (to NASA) (Goodyear Aerospace Corp., Akron, Ohio) Filed 27 Dec. 1974 11 p Sponsored by NASA
(NASA-Case-MFS-22636-1; US-Patent-Appl-SN-536762) Avail: NTIS HC $3.25 CSCL 22B

A pressurized flexible tunnel with equal length cables between the ends of the tunnel is described for use between two vehicles in outer space. The cables are lengthened or shortened by a single winch. The tunnel may be expanded or contracted as required by externally positioned orienting means. NASA

N75-14819*# Boeing Aerospace Co., Seattle, Wash. Research and Engineering Div.
EVALUATION OF A METAL FUSELAGE FRAME SELECTIVELY REINFORCED WITH FILAMENTARY COMPOSITES FOR SPACE SHUTTLE APPLICATION Final Report
S. Oken, D. E. Skoumal, and J. W. Straayer Feb. 1974 124 p refs
(Contract NAS1-10797)
(NASA-CR-132519) Avail: NTIS HC $5.25 CSCL 22B

The development of metal structures reinforced with filamentary composites as a weight saving feature of the space shuttle components is discussed. A frame was selected for study that was representative of the type of construction used in the bulk frames of the orbiter vehicle. Theoretical and experimental investigations were conducted. Component tests were performed to evaluate the critical details used in the designs and to provide credibility to the weight saving results. A model frame was constructed of the reinforced metal material to provide a final evaluation of the construction under realistic load conditions. Author

N75-14820*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
SPACE TUG AUTOMATIC DOCKING CONTROL STUDY Final Report
J. Wohl 31 Oct. 1974 125 p refs
(Contract NAS8-29747)
(NASA-CR-120578; LMSC-D424228) Avail: NTIS HC $5.25 CSCL 22B

A study was conducted to investigate the space tug automatic docking control capabilities. The subjects considered are: (1) docking sensor requirements, (2) the influence of the docking mechanism, and (3) the implications and effects of a docking abort. A digital computer simulation, was developed which included the primary aspects of the docking maneuver. Author

N75-14821*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
SPACE TUG AUTOMATIC DOCKING CONTROL STUDY. LOCDOK USERS MANUAL
31 Oct. 1974 72 p refs
(Contract NAS8-29747)
(NASA-CR-120579; LMSC-D424229) Avail: NTIS HC $4.25 CSCL 22B

A users's manual for the computer programs involved in a study of the space tug docking simulation is presented. The following subjects are considered: (1) subroutine narratives, (2) program elements, (3) system subroutines, and (4) Univac 1108 cross reference listing. The functional and operational requirements for the computer programming are explained. Author

N75-14822*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
INFLUENCE OF ORBITAL-MANEUVERING-SYSTEM FAIRINGS AND RUDDER FLARE ON THE TRANSONIC AERODYNAMIC CHARACTERISTICS OF A SPACE SHUTTLE ORBITER
James C. Ellison Washington Feb. 1975 38 p refs
(NASA-TM-X-2862; L-9580) Avail: NTIS HC $3.75 CSCL 22B

An investigation was conducted in the Langley 8-foot transonic pressure tunnel to determine the influence of orbital-maneuvering-system fairings and a flared rudder on the aerodynamic characteristics of a space shuttle-orbiter configuration. Tests were made at Mach numbers from 0.4 to 1.2, at angles of attack from -1 deg to 24 deg, at angles of sideslip of 0 deg and 5 deg, and at a Reynolds number, based on model length, of 4 million. The model with the orbital-maneuvering-system fairings had a minimum untrimmed lift-drag ratio from 7.4 to 3.4 at Mach numbers from 0.4 to 1.2 and a maximum trimmed lift-drag ratio of about 3.55 at Mach 0.8 with the rudder flared 30 deg. The directional stability was increased at Mach 0.8 and 1.2 by addition of the orbital-maneuvering-system fairings and at Mach 1.2 by flaring the rudder. Author

N75-14823*# Aerospace Corp., El Segundo, Calif. Advanced Orbital Systems Div.
OPERATIONS ANALYSIS (STUDY 2.1). PAYLOAD DESIGNS FOR SPACE SERVICING, ADDENDUM
R. R. Wolfe 30 Sep. 1974 88 p
(Contract NASw-2575)
(NASA-CR-140897; ATR-74(7341)-3-Add) Avail: NTIS

HC $4.75 CSCL 22B

Space replaceable units and payload configurations are revised to reflect increased levels of redundancy to be more consistent with current design practices. A reassessment of expendable payload design reliabilities was performed to provide a common basis for comparison with space serviceable configurations. Author

N75-14824# Aeritalia, Turin (Italy). Centro Elettronico Avio. **STUDY OF DETECTION AND ESTIMATION TECHNIQUES APPLIED TO ATTITUDE MEASUREMENTS OF SATELLITES. VOLUME 2: ATTITUDE SENSORS REVIEW AND GENERAL APPLICATIONS**

R. BaldassiniFontana, G. Simoncini, D. Sciacovelli, and A. Santinelli Apr. 1974 204 p refs Prepared jointly with Officine Galileo 4 Vol.

(Contract ESTEC-1775/72-AA)

(R-1176-CE; ESRO-CR(P)-551) Avail: NTIS HC $7.25

The most generally used satellite attitude sensors are reviewed, and functional schemes of detection and estimation techniques applied to specific attitude sensors are presented. Two sensor classes are considered: sensors which provide continuous information (static star and earth sensors, magnetic and inertial sensors), and sensors providing discontinuous information (star mapper, sun sensor, scanning IR and albedo earth sensors). Associated signal processing techniques include optimum Wiener filter and Kalman filter, and matched filter and correlation receiver. Different schemes are presented according to this classification using simplified mathematical models. Due to the simplicity requirement of onboard satellite application, only simple digital implementation of estimation algorithms are envisaged, as well as those cases which do not involve problems of computing time. ESRO

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N75-14825*# Hughes Research Labs., Malibu, Calif. Ion Physics Dept.

LOW VOLTAGE 30-cm ION THRUSTER DEVELOPMENT Final Report, 16 May 1972 - 30 Sep. 1974

H. J. King et al Nov. 1974 240 p refs

(Contracts NAS3-16528; NAS3-18334)

(NASA-CR-134731) Avail: NTIS HC $7.50 CSCL 21C

The basic goal was to advance the development status of the 30-cm electron bombardment ion thruster from a laboratory model to a flight-type engineering model (EM) thruster. This advancement included the more conventional aspects of mechanical design and testing for launch loads, weight reduction, fabrication process development, reliability and quality assurance, and interface definition, as well as a relatively significant improvement in thruster total efficiency. The achievement of this goal was demonstrated by the successful completion of a series of performance and structural integrity (vibration) tests. In the course of the program, essentially every part and feature of the original 30-cm thruster was critically evaluated. These evaluations, led to new or improved designs for the ion optical system, discharge chamber, cathode isolator vaporizer assembly, main isolator vaporizer assembly, neutralizer assembly, packaging for thermal control, electrical terminations and structure. Author

N75-14826*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. **OPTICAL PROPERTIES OF MERCURY ION THRUSTER EXHAUSTS AND IMPLICATIONS FOR SCIENCE INSTRUMENTS**

Kevin M. Monahan and Raymond Goldstein 1 Dec. 1974 53 p refs

(Contract NAS7-100)

(NASA-CR-141313; JPL-TM-33-711) Avail: NTIS HC $4.25 CSCL 21C

Emission from the exhaust plume of a 30 cm mercury ion thruster was measured from 160 to 600 nm as a function of axial and radial distance from the thruster discharge chamber. The spectrally dispersed absolute intensities were used to construct an empirical volume rate function. The function was integrated along a typical instrument field of view, and the resulting apparent brightness was compared with instrument sensitivities to evaluate the extent of optical interference. Most of the emitted radiation came from UV lines of excited mercury atoms and ions, with no observable continuum emission. The intensity levels degraded rapidly with distance from the thruster so that optical interference was negligible for fields of view not intercepting the beam axis. The operation of only one instrument, a zodiacal photopolarimeter, was considered incompatible with simultaneous thruster operation. Author

N75-14827*# Hercules, Inc., Magna, Utah. Bacchus Works. **MANUFACTURE AND STATIC FIRING OF X259-E6 ROCKET MOTOR SERIAL NUMBER XJ04/0001 Final Report**

D. Ray Robertson 28 Jan. 1975 69 p refs Prepared for LTV Aerospace Corp., Dallas

(Contract NAS1-10000)

(NASA-CR-132557) Avail: NTIS HC $4.25 CSCL 21H

A single motor was cast and static fired to demonstrate the performance of high energy crosslinked double base (XLDB) propellant in standard X259 rocket motor hardware. Prior to motor fabrication, the motor was analyzed to predict the results of static firing the X259 motor loaded with XLDB propellant. As a result of the analyses, a forward dome shrinkage liner was added to the design. With this design change it was determined that adequate margins of safety existed. The motor, designated the X259-E6 model with serial number XJ04/0001, was fabricated using a slurry-casting technique and was assembled with a standard X259-B4 nozzle which had the nozzle throat machined to a smaller inside diameter than the B4 model and the exit cone cut short for Bacchus Works altitude expansion. The motor was static fired on 20 February 1974 with the nozzle failing during motor operation. Nozzle failure was attributed to spalling of the throat material leading to complete nozzle break-up. However, the proprellant functioned as predicted in the motor chamber, ignition was normal, and char and erosion of the internal insulator were as expected. Author

N75-14828*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

HIGH PERFORMANCE AUXILIARY-PROPULSION ION THRUSTER WITH ION-MACHINED ACCELERATOR GRID

Wayne R. Hudson and Bruce A. Banks Washington Jan. 1975 25 p refs

(NASA-TM-X-3155; E-8078) Avail: NTIS HC $3.25 CSCL 21C

An improvement in thruster performance was achieved by reducing the diameter of the accelerator grid holes. The smaller accelerator grid holes resulted in a reduction in neutral mercury atoms escaping the discharge chamber, which in turn enhanced the discharge propellant utilization from approximately 68 percent to 92 percent. The accelerator grids were fabricated by ion machining with an 8-centimeter-diameter thruster, and the screen grid holes individually focused ion beamlets onto the blank accelerator grid. The resulting accelerator grid holes are less than 1.12 millimeters in diameter, while previously used accelerator grids had hole diameters of 1.69 millimeters. The thruster could be operated with the small-hole accelerator grid at neutralizer potential. Author

N75-14829*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DETERMINATION OF THE EXTENT OF ION THRUSTER EFFLUX
N. John Stevens 1975 11 p ref Proposed for presentation at 11th Elec. Propulsion Conf., New Orleans, 19-21 Mar. 1975; Sponsored by AIAA
(NASA-TM-X-71642; E-8202) Avail: NTIS HC $4.25 CSCL 21C

In the studies of proposed electric propulsion missions one of the areas of concern is the possible contamination of spacecraft instruments and thermal control surfaces by exhaust particles from an ion thruster. Vacuum tank tests were conducted in ground facilities to determine the extent of this deposition by thruster exhaust particles, but the application of these results to long term space missions is questionable. The flight thermal data from the SERT II satellite, the only electric propulsion mission with an extensive thruster operational history, was reviewed specifically to see if there is any evidence of contamination that could be attributed to the 5860 hours of mercury bombardment ion thruster operation. This evaluation of the flight data shows that the only evidence of deposition occurred on the contamination experiment solar cells which are located at the edge of the thruster exhaust beam. There is no evidence of any deposition of ion thruster efflux on any other surface of the satellite. Author

N75-14830*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRELIMINARY MEASUREMENTS OF PLASMA FLUCTUATIONS IN AN 8-cm MERCURY ION THRUSTER
John S. Serafini and Shigeo Nakanishi 21 Mar. 1975 15 p refs Proposed for presentation at 11th Elec. Propulsion Conf., New Orleans, 19-21 Mar. 1975; sponsored by AIAA
(NASA-TM-X-71650; E-8226) Avail: NTIS HC $3.25 CSCL 21C

The rms magnitude, spectra, and cross correlations for the fluctuations in the beam current, the neutralizer keeper current, and the discharge current and voltage were measured for an 8-cm diameter, dished grid ion thruster for a beam current of 72 milliamps. The ratio of the rms magnitude of the fluctuations to the time-mean neutralizer keeper current was found to depend significantly on the neutralizer time-mean keeper current, the flow rate, and keeper hold diameter. The maxima of the spectra of the beam current fluctuations did not depend on the discharge fluctuations. It was found that: (1) the discharge current fluctuations do not directly contribute to the beam current fluctuations; and (2) the neutralizer contributions to the beam fluctuations are small (for good neutralizer-to-beam coupling) but not negligible and appear mostly in the higher frequency range measured. Author

N75-14831*# Astro Research Corp., Santa Barbara, Calif.
SPOKED WHEELS TO DEPLOY LARGE SURFACES IN SPACE-WEIGHT ESTIMATES FOR SOLAR ARRAYS Final Report
R. F. Crawford, J. M. Hedgepeth, and P. R. Preiswerk Washington NASA Jan. 1975 60 p refs
(Contract NAS2-6731)
(NASA-CR-2347; ARC-R-1004) Avail: NTIS HC $4.25 CSCL 22B

Extensible booms were used to deploy and support solar cell arrays of varying areas. Solar cell array systems were built with one or two booms to deploy and tension a blanket with attached cells and bussing. A segmented and hinged rim supported by spokes joined to a common hub is described. This structure can be compactly packaged and deployed. Author

N75-14832# Gulf General Atomic, San Diego, Calif.
RADIOISOTOPE SPACE POWER GENERATOR Annual Summary Report, 1 Jul. 1971 - 30 Jun. 1972
N. B. Elsner, F. D. Postula, G. C. Bradshaw, E. J. Steeger, R. L. Leedy, and C. W. Mautz 1 Mar. 1974 95 p refs
(Contract AT(04-3)-943)
(GA-A-12848) Avail: NTIS HC $4.75

The Isotec Technology FY1972 Annual Summary Report is an account of several different efforts: (1) continuing development in fabricating and characterizing TAGS, (2) segmenting of different combinations of materials, such as PbSnMnTe/BiSbTe and PbSnMnTe/TAGS, (3) isothermal testing in ultrahigh vacuum of SiGe and SiMo to determine their free vaporization rate and compatibility with different insulations, (4) studies of a means for measuring intermediate range thermal conductivities with small samples of material, and (5) transit activities, which consisted of TRANSIT launch support, fabrication of a display model of the generator, and thermoelectric testing. Author (NSA)

N75-14833# Los Alamos Scientific Lab., N.Mex.
PLUTONIA AERODYNAMIC DISK (PAD)
J. J. Burns and J. W. Vorreiter Jan. 1974 26 p refs
(Contract W-7405-eng-36)
(LA-5527-MS) Avail: NTIS HC $3.75

A modular heat source for radioisotope thermoelectric generators was developed, with primary consideration for nuclear safety. Analytical effort was directed to areas such as generator integration, launch abort, reentry, and postimpact. Experimental efforts included air drop, hypersonic wind tunnel, and impact testing. Progress was made in vent development, clad compatibility, and fuel processing. Results are summarized. Basic fuel capsule characteristics that are desirable from a safety standpoint are identified. Recommendations for future efforts are included. Author (NSA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N75-14834* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ANTI-FOG COMPOSITION Patent
Harry D. Morrison (Brown and Root-Northrop) and Dorrie L. Carmin, Jr., inventors (to NASA) (Brown and Root-Northrop) Issued 24 Dec. 1974 7 p Filed 8 Sep. 1971 Supersedes N73-11107 (11 - 02, p 0137) Continuation-in part of abandoned US Patent Appl. SN-69488, filed 3 Sep. 1970 Sponsored by NASA
(NASA-Case-MSC-13530-2; US-Patent-3,856,534; US-Patent-Appl-SN-178771; US-Patent-Class-106-13; US-Patent-Class-106-15R; US-Patent-Class-106-287SB; US-Patent-Class-117-124F; US-Patent-Class-117-135.5; US-Patent-Class-252-70; US-Patent-Class-252-549; US-Patent-Appl-SN-69488) Avail: US Patent Office

An anti-fog composition is described for the prevention of fogging on surfaces such as space helmet visors, spacecraft windows, and windshields. It is composed of a surface active agent, water, and an oil time extender.
Official Gazette of the U.S. Patent Office

N75-14835*# Monsanto Research Corp., St. Louis, Mo.
SYNTHESIS AND EVALUATION OF C-ETHER FORMULATIONS FOR USE AS HIGH TEMPERATURE LUBRICANTS AND HYDRAULIC FLUIDS
F. S. Clark, R. L. Green, and D. R. Miller Dec. 1974 298 p refs
(Contract NAS3-15333)
(NASA-CR-134643; MRC-SL-460) Avail: NTIS HC $8.75 CSCL 07C

The formulation and evaluation of C-ether fluids for use in the hydraulic and lubrication systems of the space shuttle and advanced air breathing engines were studied to lower the pour point of a reference C-ether from -29 C to -40 C without changing its evaporation loss. Use of disiloxanes mixed with C-ethers gave a -40 C pour point fluid with little change in the desired evaporation loss or in oxidative stability. A second -40 C pour point fluid containing only C-ethers was also developed. A screening program tested lubrication additives for C-ethers and the new fluids. Six additive packages were chosen for evaluation in 316 C bearing tests, two for evaluation in 260 C pump tests. The goal of the bearing test was a 100 hour run. The rig was a specially designed 80-mm axially loaded ball bearing. The C-ether base fluid ran only one hour at 316 C before cage wear failure occurred. The best additive blends ran 47, 94 and

100 hours. The 96 hour test gave excessive deposits. The 100 hour test had no wear failures; an unexplained loss of cage silver occurred from areas of direct fluid impingement on the cage. Author

N75-14836# Materials Research Labs., Maribyrnong (Australia).
RECRYSTALLIZATION OF NITROGUANIDINE FROM GELATIN SOLUTION
R. P. Parker Oct. 1974 19 p refs
(MRL-TN-354) Avail: NTIS HC $3.25

Recrystallization of nitroguanidine (NQ) from gelatin solution is performed. The NQ produced as high bulk density and a crystal size and shape suitable for use in cast compositions. Author

N75-14837# Army Foreign Science and Technology Center, Charlottesville, Va.
THERMAL STABILITY OF POLYHETEROARYLENES
E. M. Bondarenko and V. V. Rode 18 Feb. 1974 46 p refs Transl. into ENGLISH from the book "Uspekhi Khimii i Fiziki Polimerov" Moscow, 1970 p 206-231
(AD-786035; FSTC-HT-23-1871-73) Avail: NTIS CSCL 07/3

Fully aromatic high-molecular compounds exhibit high thermal stability and a prominent class of these compounds is the polyheteroarylenes -- aromatic systems consisting of aromatic rings and various heterocycles. This review summarizes literature reports through 1969 on polyheteroarylenes containing five--membered heterocycles (polyimides, polybenzazoles, and polyazoles), polyheteroarylenes containing six-membered heterocycles (polynaphthyridines and polyazines), and mixed polyheteroarylenes. GRA

N75-14838# Naval Ordnance Lab., White Oak, Md.
A METHOD FOR THE SEPARATION OF OIL FROM AN AQUEOUS OIL-DETERGENT SOLUTION PRIOR TO IR ANALYSIS Final Report
Charles E. Adams 19 Jul. 1974 15 p
(SF53554706)
(AD-786703; NOLTR-74-102) Avail: NTIS CSCL 07/3

A procedure was devised to permit the analysis of oil in water solutions in the presence of dissolved detergents using the CCl4 extraction-IR spectrophotometric method. After an initial extraction of the aqueous oil-detergent solution with CCl4, the extract was evaporated on a silica gel column and eluted with CCl4. This procedure effectively removed all the detergent and allowed an interference-free analysis of the CCl4-oil solution with the IR spectrophotometer. About 10% of the initial oil was lost in the procedure. Author (GRA)

24 COMPOSITE MATERIALS

Includes laminates.

N75-14839*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INSULATION FOIL AND METHOD OF MAKING Patent Application
Edward A. Maslowski, inventor (to NASA) Filed 11 Dec. 1974 10 p
(NASA-Case-LEW-11484-2; US-Patent-Appl-SN-531568) Avail: NTIS HC $3.25 CSCL 11D

A method for fabricating multi-foil insulation systems is described. Metal foils with protuberances which are capped with ceramic coatings are produced by the method. The coated protuberances provide spacing between the foils, while the ceramic coatings serve as thermal barriers to metallic heat conduction between the foils. Diagrams of the fabricating equipment and the resulting product are developed. NASA

N75-14840*# Kanner (Leo) Associates, Redwood City, Calif.
STRENGTH OF COMBINED MATERIALS (SURVEY)
G. N. Mekhed Washington NASA Dec. 1974 17 p refs Transl. into ENGLISH from the book "Prochnost' kombinirovannykh materialov (obzor)" Moscow, Nauka Press, 1971 p 169-177 (Contract NASw-2481)
(NASA-TT-F-16052) Avail: NTIS HC $3.25 CSCL 11D

A review is presented of studies dealing with the strength characteristics of a class of materials which are composed of two or more macro- or micro-components different in shape and composition, insoluble in each other but firmly bonded with each other in the combined material. The materials include laminar compositions, compositions consisting of particles with or without binders, fiber composites with or without binders, flake-filled composites with binders, and composites with a skeleton and a filler consisting of different materials. The strength of these materials is assessed and suggestions are given for improving their mechanical performance. Author

N75-14841*# TRW Equipment Labs., Cleveland, Ohio.
RESIN/GRAPHITE FIBER COMPOSITES
P. J. Cavano 5 Dec. 1974 76 p refs
(Contract NAS3-17772)
(NASA-CR-134727; TRW-ER-7677F) Avail: NTIS HC $4.75 CSCL 11D

Processing techniques were developed for the fabrication of both polyphenylquinoxaline and polyimide composites by the in situ polymerization of monomeric reactants directly on the graphite reinforcing fibers, rather than using previously prepared prepolymer varnishes. Void-free polyphenylquinoxaline composites were fabricated and evaluated for room and elevated flexure and shear properties. The technology of the polyimide system was advanced to the point where the material is ready for commercial exploitation. A reproducible processing cycle free of operator judgment factors was developed for fabrication of void-free composites exhibiting excellent mechanical properties and a long time isothermal life in the range of 288 C to 316 C. The effects of monomer reactant stoichiometry and process modification on resin flow were investigated. Demonstration of the utility and quality of this polyimide system was provided through the successful fabrication and evaluation of four complex high tip speed fan blades. Author

N75-14842*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
IMPACT RESISTANCE OF COMPOSITE FAN BLADES Technical Report, Jul. 1972 - May 1974
Dec. 1974 142 p
(Contract NAS3-16777)
(NASA-CR-134707; R74AEG320) Avail: NTIS HC $5.75 CSCL 11D

Results are presented of a program to determine the impact resistance of composite fan blades subjected to foreign object damage (FOD) while operating under conditions simulating a short take-off and landing (STOL) engine at takeoff. The full-scale TF39 first-stage fan blade was chosen as the base design for the demonstration component since its configuration and operating tip speeds are similar to a typical STOL fan blade several composite configurations had already been designed and evaluated under previous programs. The first portion of the program was devoted toward fabricating and testing high impact resistant, aerodynamically acceptable composite blades which utilized only a single material system in any given blade. In order to increase the blade impact capability beyond this point, several mixed material (hybrid) designs were investigated using S-glass and Kevlar as well as boron and graphite fibers. These hybrid composite blades showed a marked improvement in resistance to bird impact over those blades made of a single composite material. The work conducted under this program has demonstrated substantial improvement in composite fan blades with respect to FOD resistance and has indicated that the hybrid design concept, which utilizes different types of fibers in various portions of a fan blade design depending on the particular requirements of the different areas and the characteristics of the different fibers involved, shows a significant improvement over those designs utilizing only one material system. Author

N75-14843# Army Materials and Mechanics Research Center, Watertown, Mass.
SHOCK HARDNESS OF GRAPHITE/EPOXY COMPOSITES
David K. Roylance 1973 16 p refs
(AD-785671) Avail: NTIS CSCL 11/4

The principal requirements for ABM (Advanced Ballistic Missile) substructure materials are outstanding strength and stiffness at low weight. Carbon/epoxy composites are particularly

attractive in this regard. In fact, these composites are presently undergoing intensive assessment studies in anticipation of their being employed as substructure material for the Advanced Terminal Interceptor (ATI) system. This paper presents the results of an important phase of this assessment: the resistance, or hardness, of graphite/epoxy composites against damage due to intense shock waves. A shock hardness study of composites consists of two distinct phases: the measurement of the material's ability to mitigate a compressive wave before tensile components arise, and the material's ability to withstand dynamic fracture once the tensile components do arise. GRA

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N75-14844* National Aeronautics and Space Administration. Pasadena Office, Calif.
AMINO ACID ANALYSIS Patent
Milton Winitz (Vivonex Corp., Mountain View, Calif.) and Jack Graff, inventors (to NASA) (Vivonex Corp., Mountain View, Calif.) Issued 24 Dec. 1974 8 p Filed 5 Aug. 1968 Sponsored by NASA
(NASA-Case-NPO-12130-1; US-Patent-3,856,471; US-Patent-Appl-SN-750235; US-Patent-Class-23-253R; US-Patent-Class-23-230B) Avail: US Patent Office CSCL 07D

The process and apparatus for qualitative and quantitative analysis of the amino acid content of a biological sample are presented. The sample is deposited on a cation exchange resin and then is washed with suitable solvents. The amino acids and various cations and organic material with a basic function remain on the resin. The resin is eluted with an acid eluant, and the eluate containing the amino acids is transferred to a reaction vessel where the eluant is removed. Final analysis of the purified acylated amino acid esters is accomplished by gas-liquid chromatographic techniques.
Official Gazette of the U.S. Patent Office

N75-14845 Polish Academy of Sciences, Warsaw.
MECHANICAL REACTION OF DEFECTS [MECHANICZNE ODDZIALYWANIA DEFEKTOW]
Andrzej Radowicz 1973 55 p refs In POLISH
(Rept-22/1973) Avail: Issuing Activity

Defects in continuous and crystalline media were investigated by using a defect model. An equation was derived which describes relaxation and gives information about the defect's action on a grid. Free oscillations in the crystal lattice, defects in anisotropic media, dynamic interactions of defects, and integral transformations are also discussed. Transl. by M.J.S.

N75-14846 Central Electricity Generating Board, London (England).
EFFECT OF HYDRAZINE ON THE IRON/WATER SYSTEM
G. Bohnsack 1972 18 p refs Transl. into ENGLISH from VGB Feedwater Conf. (West Ger.), 1972 p 2-8
(CE-Trans-6537) Avail: Issuing Activity

The autooxidation of hydrazine with oxygen is reviewed. Hydrazine inhibits oxygen corrosion by combining with oxygen and thereby removing it. Activated hydrazine, Levoxin, was developed, because the normal reaction of hydrazine and oxygen is slow. Reduction, basicity, and oxidation form the roots of hydrogen peroxide and hydrazine reactions. Author

N75-14847*# General Electric Co., Philadelphia, Pa. Space Sciences Lab.
CRYSTAL GROWTH IN FUSED SOLVENT SYSTEMS Final Report
Donald R. Ulrich, Barry A. Noval, William B. White (Penn. State Univ.), Karl E. Spear (Penn. State Univ.), and E. C. Henry Nov. 1974 174 p refs
(Contract NAS8-28114)
(NASA-CR-120570) Avail: NTIS HC $6.25 CSCL 20B

The successful nucleation of bismuth germanate, B12GeO20 on a high quality seed and the growth of regions of single crystals of the same orientation of the seed are reported. Lead germanate, Pb5Ge3O11 was also identified as a ferroelectric crystal with large electrooptic and nonlinear optic constants. Solvent criteria, solvent/development, and crystal growth are discussed, and recommendations for future studies are included. F.O.S.

N75-14848*# Stanford Univ., Calif. Dept. of Mechanical Engineering.
KINETICS OF NITRIC OXIDE FORMATION AND DECOMPOSITION Final Technical Report, 1 Dec. 1971 - 30 Nov. 1974
C. H. Kruger and R. K. Hanson 30 Nov. 1974 9 p
(Grant NGR-05-020-583)
(NASA-CR-141272) Avail: NTIS HC $3.25 CSCL 07B

Experiments on shock wave structure were conducted in the 12 inch shock tube facility, and it is shown that this work was motivated by the need for improved kinetics for the modeling of NO production in space shuttle flow fields. The experiments on shock structure involved simultaneous observations of pressure and temperature on the wall of the shock tube during reflection of normal shock waves in inert gases. M.C.F.

N75-14849*# Stanford Univ., Calif. Dept. of Mechanical Engineering.
KINETICS OF THE REACTION OF NITRIC OXIDE WITH HYDROGEN
W. L. Flower, R. K. Hanson, and C. H. Kruger [1974] 23 p refs
(Grants NGR-05-020-583; NASA STN-309)
(NASA-CR-141273) Avail: NTIS HC $3.25 CSCL 07B

Mixtures of NO and H2 diluted in argon or krypton were heated by incident shock waves, and the infrared emission from the fundamental vibration-rotation band of NO at 5.3 microns was used to monitor the time-varying NO concentration. The reaction kinetics were studied in the temperature range 2400-4500 K using a shock-tube technique. The decomposition of nitric oxide behind the shock was found to be modeled well by a fifteen-reaction system. A principle result of the study was the determination of the rate constant for the reaction H + NO yields N + OH, which may be the rate-limiting step for NO removal in some combustion systems. Experimental values of k sub 1 were obtained for each test through comparisons of measured and numerically predicted NO profiles. Author

N75-14850*# Kanner (Leo) Associates, Redwood City, Calif.
VOLTAMETRY WITH LINEAR VARIATION OF THE POTENTIAL APPLIED TO THE STUDY OF ELECTROCHEMICAL REACTIONS
I. C. Raducanu and D. Geana Washington NASA Jan. 1975 43 p refs Transl. into ENGLISH from Stud. Cercet Chim. (Romania), v. 22, no. 5, 1974 p 573-600
(Contract NASw-2481)
(NASA-TT-F-16124) Avail: NTIS HC $3.75 CSCL 07A

The possibilities of the method and the principle of instrumentation are analyzed and discussed. The applications of the method to certain types of reactions, including those which involve adsorption to the electrode, are presented schematically. Author

N75-14851*# Linguistic Systems, Inc., Cambridge, Mass.
NEW DATA ON THE FORMATION OF Ca(O2)2 BY MEANS OF CaO2 x 2H2O2
I. I. Volnov and A. N. Shatunina Washington NASA Nov. 1974 5 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Khim. (USSR), no. 11, 1966 p 2032-2033
(Contract NASw-2482)
(NASA-TT-F-15796) Avail: NTIS HC $3.25 CSCL 07B

The transformation of the compound CaO2.2H2O2 at 40 deg and 0.006 mm Hg as a result of the intramolecular redox reaction into equimolecular mixture of hyperoxide and hydroxide of calcium is reported. Author

N75-14852# Atlantic Richfield Hanford Co., Richland, Wash.
HEAT OF COMBUSTION OF SOLVENTS USED IN NUCLEAR FACILITIES
C. H. Kindle Feb. 1974 17 p refs
(Contract AT(45-1)-2130)
(ARH-2862) Avail: NTIS HC $3.25

An adiabatic bomb calorimeter was used to measure the heat of combustion of hexone, normal paraffin hydrocarbon (NPH), tributyl phosphate (TBP), dibutylbutyl phosphonate (DBBP), and di(2-ethylhexyl) phosphoric acid (D2EHPA) and certain of their mixtures. The effects of pressure, temperature, solvent mixing, water, and dilute acid contact on the heat of combustion are briefly discussed. Author (NSA)

N75-14853# Bhabha Atomic Research Centre, Bombay (India). Spectroscopy Div.
X-RAY FLUORESCENCE DETERMINATION OF TRACE IMPURITIES Nb, Fe, Mn, AND Ti IN HIGH PURITY Ta2O5 AND K2TaF7
R. M. Agrawal and P. P. Khanna 1973 21 p refs
(BARC-698) Avail: AEC Depository Libraries HC $4.25

An X-ray fluorescence spectrometric method is described for the rapid determination of trace impurities Nb, Fe, Mn, and Ti in high purity Ta2O5 and K2TaF7. The sample is presented to the spectrometer in the form of a double layer pellet, where it is irradiated by X-rays from a high power X-ray spectrometry tube with tungsten target. The fluorescent X-rays emitted are analyzed using a LiF (200) crystal. Synthetic standards prepared from high purity compounds are used for the calibration purposes. The Nb, Mn, and Ti can be conveniently determined up to a lower limit of 20 ppM and Fe to 100 ppM. The standard deviation of the method is about + or - 10% for the concentration range around 50 ppM and + or - 2% for the range around 500 ppM. The limits of detection calculated for 100 seconds counting time are 10 ppM for Nb and Fe and 4 ppM for Mn and Ti.
Author (NSA)

N75-14854# Bhabha Atomic Research Centre, Bombay (India). Spectroscopy Div.
X-RAY FLUORESCENCE ANALYSIS OF LOW ALLOY STEELS FOR Mo, Cu, Ni, Mn, Cr, AND V
R. M. Agrawal and P. P. Khanna 1973 19 p ref
(BARC-699) Avail: AEC Depository Libraries HC $4.00

An X-ray fluorescence method is described for the rapid determination of Mo, Cu, Ni, Mn, Cr, and V in low-alloy steels in the usual concentration range. The sample is presented to the spectrometer in the form of a disc of 40 mm or 1 1/4 in. diameter and 1/8 in. to 1 in. thickness. LiF (200) and/or topaz crystals are used for X-ray dispersion. The standard deviation of the method is better than + or - 1%. Author (NSA)

N75-14855# Atlantic Richfield Hanford Co., Richland, Wash.
EFFECTS OF IRRADIATION OF COMBUSTION OF ORGANIC COMPOUNDS: A LITERATURE SURVEY
G. S. Barney Feb. 1974 7 p refs
(Contract AT(45-1)-2130)
(ARH-2861) Avail: NTIS HC $3.25

Information found in the literature indicates that combustion efficiency and flame speed are increased when fuel-air mixtures are irradiated with very intense beta or gamma sources. In order to show any noticeable effect, however, radiation fields of at least 2000 Ci per cubic inch must be present.
Author (NSA)

N75-14856# Battelle-Northwest, Richland, Wash.
ELECTROCHEMICAL DETERMINATION OF OXYGEN AND THE THERMODYNAMICS OF ITS SOLUBILITY IN LIQUID METAL SYSTEMS
H. Sundermann 1974 5 p refs Transl. into ENGLISH from Mikrochim. Acta, Suppl. (Austria), no. 5, 1974 p 303-306
Sponsored by AEC
(BNWL-tr-125) Avail: NTIS HC $3.25

For direct determination of oxygen concentrations through EMF-measurements the thermodynamics of solubility was investigated for metallic melts and the influence of multinary components on dissolved non-metallic components accompanied by a change of activity was assessed. In addition to the transfer of activity, the thermodynamic relationships allow to transfer EMF-values to the analytically more interesting concentration values. With respect to each melt, the straight EMF-temperature lines dependent on oxygen content possess one common intersection at zero point of temperature, which is dependent only on the heat of solution. The theoretical relationships were confirmed experimentally in sodium and in copper melts with negligible error. Author (NSA)

N75-14857# Army Foreign Science and Technology Center, Charlottesville, Va.
PHYSICAL CHEMISTRY OF PHOTOGRAPHIC DEVELOPMENT
G. P. Faerman and V. I. Sheberstov 14 May 1974 35 p refs Transl. into ENGLISH from Usp. Nauchn. Fotogr. (USSR), v. 15, 1970 p 152-164
(AD-784744; FSTC-HT-23-1182-73) Avail: NTIS CSCL 07/4

Presented is a brief survey of the history of research in photographic development in the Soviet Union. Development processes are sketched in various stages of their study; investigators and teams are indicated. The bibliography is extensive. GRA

N75-14858# Hebrew Univ., Jerusalem (Israel). Graduate School of Applied Science and Technology.
GROWTH OF BARIUM FERRITE FOR MAGNETIC OPTICAL DEVICES Final Report, 1 Jan. - 31 Dec. 1973
M. Schieber, J. Aidelberg, and J. Flicstein Dec. 1973 28 p refs
(Contract DAJA37-73-C-2415; DA Proj. 2O0-61102-B-31E)
(AD-786666) Avail: NTIS CSCL 20/2

Single crystals of BaFe12O19 grown from a BaO-B2O3-PbO flux show the classical hexagonal cells hitherto known to occur in constitutionally supercooled solidified metallic alloys. The size of the cells varies from 10-20 micrometers increasing with the amount of the PbO in the flux. Electron microprobe analysis across both longitudinal (1010) and transversal (0001) slices of the cells shows a strong periodical variation of Ca and Sr impurities as well as a slight periodical variation of the concentration of Ba, Pb and Fe at the cell boundaries of the constitutionally supercooled BaFe12O19 crystals. The suppression of the cellular growth has not been successful so far. The use of high purity BaCO as a source for BaO is the most recommended future growth experiment. Author (GRA)

N75-14859# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SPECTROSCOPIC STUDIES OF COMBUSTION ZONES IN FLAME OF CONDENSED SYSTEMS
V. M. Maltsev, A. G. Stasenko, B. A. Seleznev, and P. F. Pokhil 16 Sep. 1974 16 p refs Transl. into ENGLISH from Fiz. Goreniya Vzryva (USSR), v. 9, no. 2, May/Apr. 1973 p 220-225
(AD-785962; FTD-HT-23-1236-74) Avail: NTIS CSCL 21/2

The authors pose the problem of identifying the flame radiation spectrum of condensed systems, establishing the distribution of revealed products with respect to the height of the flame, and, if possible, establishing their degree of participation in the combustion process. They studied the flame radiation spectrum of hexogen, a model mixed composition based on ammonium perchlorate and polymethylmethacrylate, and nitrocellulose. The flames which formed during combustion was studied by two spectral methods - photographic and photoelectric. GRA

N75-14860# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STEPWISE MECHANISMS IN CATALYTIC OXIDATION REACTIONS
G. K. Goreskov 16 Aug. 1974 27 p refs Transl. into ENGLISH from the book "Problemy Kinetiki i Kataliza. 15: Mekhanizm i Kinetika Geterogennykh Reaktsii" USSR, 1973 p 27-39
(FTD Proj. T74-04-08)
(AD-784846; FTD-MT-24-1747-74) Avail: NTIS CSCL 07/4

The reaction mechanisms of catalytic oxidation reduction reactions are considered. Oxidation on metal oxides is discussed. Two contrasting mechanisms are described: stepwise consecutive interaction of reactants and catalysts and simultaneous interaction of reactant and catalyst. GRA

N75-14861# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
IGNITION LIMIT OF METAL PARTICLE IN MIXTURE OF TWO OXIDIZERS
G. K. Ezhovskii, E. S. Ozerov, and A. A. Yurinov 16 Sep. 1974 12 p refs Transl. into ENGLISH from Fiz. Goreniya Vzryva (Novosibirsk), v. 9, no. 2, Mar./Apr. 1973 p 325-327
(AD-786111; FTD-HT-23-1239-74) Avail: NTIS CSCL 21/2

The dependence was investigated of the limiting oxidation temperature on the oxidizer concentration. Magnesium and beryllium oxidizers are discussed along with water vapor oxidation. It was found that the surface coated with hydroxide (as a result of water vapor oxidation of a metal) has a higher reactivity than the surface covered by a metal oxide. M.J.S.

N75-14862# Army Foreign Science and Technology Center, Charlottesville, Va.
EFFECT OF ORGANIC SEMICONDUCTOR ADDITIVES ON THE THERMAL DECOMPOSITION OF BARIUM AZIDE
V. F. Komarov, V. V. Boldyrev, I. L. Kotlyarevskii, A. I. Skorik, and M. P. Terpugova 9 Nov. 1973 6 p refs Transl. into ENGLISH from Zh. Vses. Khim. Obschest. (USSR), v. 12, no. 6, 1967 p 695-969
(AD-786798; FSTC-HT-23-1210-73) Avail: NTIS CSCL 07/2

The effect of the addition of organic semiconductors and inorganic semiconductors on thermal decomposition of barium azide was investigated. Lengthening and bending of polymer chains appears to inhibit barium azide decomposition and introduction of side chains to aromatic nuclei appears to weaken the inhibiting effect. The inhibition may be connected with increase in conjugation of multiple bonds and more complete generalization of pi-electrons, leading to change in the electron work function. GRA

N75-14863# Army Materials and Mechanics Research Center, Watertown, Mass.
THE LATTICE PLANE VIEW OF BOUNDARY COINCIDENCE Final Report
Gordon A. Bruggeman and George H. Bishop, Jr. May 1974 21 p
(DA Proj. 1T1-61102-B-32A)
(AD-786515; AMMRC-TR-74-11) Avail: NTIS CSCL 20/2

The structures of various boundaries and interphase interfaces are viewed as the alignment of lattice plane networks in the two crystals, such that optimum matching is achieved at the interface. A large variety of planar boundaries, including rather complex mixed tilt and twist boundaries, may be viewed in this way. Congruent networks correspond with exact coincidence boundaries; commensurate networks correspond with near-coincidence boundaries. The nature and form of the arrays of grain boundary dislocations resulting from different types of misalignment of the networks are discussed. Secondary dislocations which accommodate rotational mismatch, and registry dislocations which accommodate lattice mismatch, are both shown to be related to network misalignment. Finally, the lattice plane view of various structural unit models of grain boundaries is presented. Author (GRA)

N75-14864# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EFFECT OF METAL ADDITIVES AND THEIR BORIDES ON COMBUSTION RATE OF MIXED SYSTEMS
L. A. Romodanova and P. F. Pokhil 18 Sep. 1974 13 p refs Transl. into ENGLISH from Fiz. Goreniya Vzryva (Novosibirsk), v. 9, no. 2, Mar. - Apr. 1973 p 230-235
(AD-786901; FTD-HT-23-1237-74) Avail: NTIS CSCL 21/2

In order to ascertain the effect of molybdenum, zirconium, titanium, tungsten, iron, boron, and the borides of these metals on the combustion rate of mixed compositions the following stoichiometric compositions were prepared: oxidizer-ammonium perchlorate, fuel-methanoic acid and polymethylmethacrylate. The compositions were burned in a bomb (in a nitrogen atmosphere) and under the dome of a vacuum device. A photoregister was used to determine the combustion rate. GRA

N75-14865# Utah Univ., Salt Lake City. Dept. of Chemistry.
KINETIC STUDIES OF METAL ION COMPLEXATION AND DYE DIMERIZATION BY LASER ULTRASOUND AND LASER T-JUMP
M. Mm. Farrow, N. Purdie, A. L. Cummings, W. Herrmann, Jr., and Edward M. Eyring 17 Sep. 1974 24 p refs
(Contract N00014-67-A-0325-0008; NR Proj. 051-556)
(AD-786219; TR-4) Avail: NTIS CSCL 07/4

There are two comparatively new relaxation techniques for measuring nanosecond time scale reaction rates in liquids: the laser Debye-Sears ultrasonic absorption method and the laser Raman temperature jump technique. Advantages and limitations of these techniques are reviewed, and their use in kinetic studies of metal ion complexation and dye dimerization is surveyed. Author (GRA)

N75-14866# Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.
INVESTIGATION OF ELECTROCATALYSTS BY LOW ENERGY ELECTRON DIFFRACTION AND RETATED TECHNIQUES
Johann A. Joebstl, Grayson W. Walker, and William A. Adams 1973 14 p refs
(AD-785638) Avail: NTIS CSCL 07/4

A realistic candidate for electric power generation is the direct oxidation hydrocarbon/air fuel cell. Its fuel cell reactions only proceed with reasonable reaction rates in the presence of catalysts. The report discusses the use of low energy electron diffraction to study new catalysts. GRA

N75-14867# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SYNTHESIS AND INVESTIGATION OF ETHER DIOLS AND POLYURETHANES CONTAINING SILPHENYLENE
V. P. Kuznetsova and N. Ya. Kuzmenko 18 Sep. 1974 16 p refs Transl. into ENGLISH from Sin. Fiz.-Khim. Polimerov, Akad. Nauk Ukr. SSR, Inst. Khim. Vysokomolekul. Soedin., Sb. Statei (Kiev), no. 11, 1973 p 110-115
(AD-786900; FTD-HT-23-1368-74) Avail: NTIS CSCL 07/3

The article describes the synthesis of new ether diols with bonds Si-O-6 and Si-C, containing silphenylene links which can be used for obtaining polymers with increased heat resistance. GRA

N75-14868# California Univ., Berkeley.
CATALYSIS ON BINARY ALLOYS
G. A. Somorjai and D. I. Hagen Sep. 1974 7 p Sponsored in part by AEC
(Contract N00014-69-A-0200-1069; NR Proj. 056-568)
(AD-786776; TR-1) Avail: NTIS CSCL 07/1

Hydroforming and hydrocracking reactions, such as hydrogenolysis, isomerization, and dehydrocyclization, of various hydrocarbons have been carried out on platinum and platinum-gold alloys under low pressure and clean surface conditions as part of an overall effort to determine the effects of alloying on such reactions. Author (GRA)

N75-14869# AeroChem Research Labs., Inc., Princeton, N.J.
MEASUREMENTS OF ALUMINUM OXIDE KINETICS Final Technical Report, 1 Mar. - 30 Jun. 1974
William Felder and Arthur Fontijn Aug. 1974 18 p refs
(Contract F30602-73-C-0339; ARPA Order 1649; AF Proj. 1649)
(AD-786423; AeroChem-TP-313; RADC-TR-74-252) Avail: NTIS CSCL 07/2

The AeroChem high-temperature fast-flow reactor has been adapted to allow direct observation of AlO, $v = 0$ and 1 by laser-induced fluorescence. The rate coefficient k for the homogeneous gas phase reaction AlO + O2 to AlO2 + O has been measured by this technique. Using the collision frequency rate factor as an upper limit, the measurements suggest an activation energy for this reaction of $<$ or $=$ 0.8 eV. (Modified author abstract) GRA

N75-14870# Army Material Command, Texarkana, Tex. Intern Training Center.
LIFE CYCLE COST STUDY OF ARMY SPECTROMETRIC OIL ANALYSIS PROGRAM (ASOAP) Final Report
Henry L. Martin Apr. 1974 59 p refs
(AD-786501; USAMC-ITC-02-08-73-018) Avail: NTIS CSCL 14/2

The scope of this paper is to determine the present life cycle cost (LCC) of ASOAP (Army Spectrometric Oil Analysis Program) based on certain assumptions. A cost model capable of determining the life cycle cost of ASOAP for both the atomic absorption spectrometry and the atomic emission spectrometry is developed. Next, using this cost model, the feasibility of the oil analysis program is determined. Finally, interest is focused on the benefits that the program has brought about in the past, and future benefits will be projected. A brief history of the Army's intervention into oil analysis, LCC, and cost models is presented. A brief discussion on the two methods of analysis that the Army uses and some estimations of various costs that are associated with ASOAP are included. A general cost model and a cost model for ASOAP is developed with a discussion of the various components. (Modified author abstract) GRA

N75-14871# Chem Systems, Inc., New York.
LIQUID PHASE METHANATION Interim Report, Apr. 1972 - Jan. 1973
May 1974 100 p refs
(Contract DI-14-32-0001-1505)
(PB-235858/8; OCR-78-INT-1; IR-1) Avail: NTIS; SOD HC $1.30 CSCL 07A

A new process is presented for methanating carbon monoxide and hydrogen mixtures in the presence of a liquid. Proof is offered that the process is suitable for further development in a process development unit and then in a pilot plant. The report also screens the catalyst and liquids which could be used in the process. The experimental data on an aromatic material clearly showed that the chosen aromatic, pseudocumene, was a suitable liquid, and that the methanation rates in this liquid were higher than the rates obtained when mineral oil was the fluidization liquid. It was found that if catalyst activity is to be kept constant, it is necessary to maintain a hydrogen atmosphere during shutdown. GRA

N75-14872# Rensselaer Polytechnic Inst., Troy, N.Y. Div. of Fluid, Chemical, and Thermal Processes.
EFFECT OF THERMOCAPILLARITY ON THE EVAPORATING MENISCUS Report for 31 Aug. 1973 - 31 Aug. 1974
M. L. Potash and P. C. Wayner, Jr. 31 Aug. 1974 23 p refs
(Grants NSF GK-43116; NSF GK-24223)
(PB-235737/4; RPI-TCTP-001) Avail: NTIS HC $3.25 CSCL 07D

The transport processes occurring in an evaporating extended meniscus and adsorbed thin film formed on a superheated flat plate immersed in a pool of saturated carbon tetrachloride are modeled and analyzed. The effects of disjoining pressure, capillarity, thermocapillarity, and superheat are evaluated. Thermocapillarity does not have a significant effect on the upper portion of the evaporating meniscus. GRA

N75-14873# Franklin Inst. Research Labs., Philadelphia, Pa.
STUDY OF PI-BONDING IN SILICON NITRIDE AND RELATED COMPOUNDS Final Report, May - Jul. 1974
Peter E. D. Morgan 1 Aug. 1974 32 p refs
(Contract N00014-69-C-0055)
(AD-784997; FIRL-F-C2429) Avail: NTIS CSCL 07D

The degree and nature of (p-d)pi-bonding in various silicon nitrogen compounds was studied. The simple solid compounds may in fact be one of the more easily studied examples of this mode of bonding. On the basis of relative bond lengths and angular relationships it is predicted that, assuming both alpha and beta silicon nitrides are pure Si3N4 compounds, the beta form is more stable than the alpha although, probably, only by a very small amount. Some implications for Si-Al-O-N bonding are reviewed. Molecular orbital calculations should be enlightening as to the stereochemical relationships between a tetrahedral silicon atom and variously disposed ligands with internal pi bonding capability. Author (GRA)

N75-14874# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SOME QUESTIONS OF SURFACE IONIZATION
N. I. Ionov 22 Aug. 1974 15 p refs Transl. into ENGLISH from the book "Problemy Kinetiki i Kataliza. 15: Mekhanizm i Kinetika Geterogennykh Reaktsii" USSR, 1973 p 138-142
(FTD Proj. T74-04-08)
(AD-785152; FTD-MT-24-1760-74) Avail: NTIS CSCL 07/4

The phenomenon of surface ionization is discussed. Desorption kinetics are considered, including thermodynamic aspects. Applications to catalysis are mentioned. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N75-14875 Ecole Nationale Superieure de Mechanique et d'Aerotechnique, Poitiers (France). Lab. de Mecanique et de Physique des Materiaux.
FATIGUE FRACTURE MECHANISMS OF ALUMINUM ALLOYS. INFLUENCE OF STRUCTURE AND ENVIRONMENT Final Report [ETUDE DES MECANISMES DE RUPTURE PAR FATIGUE D'ALLIAGES D'ALUMINUM. INFLUENCE DE LA STRUCTURE ET DE L'ENVIRONNEMENT]
J. deFouquet, B. Bouchet, and D. Fournier Sep. 1973 38 p refs In FRENCH
(Contract DGRST-71-7-2783)
Avail: Issuing Activity

The effects of a gaseous environment, dry and humid air, dry and humid nitrogen, nitrogen-hydrogen, and vacuum on the fatigue behavior of an Al-Cu 4% alloy, were investigated by microfractography, crack propagation velocity measurement, and Wholer curves. The microfractographic characteristic facets of the fractures were determined using polycrystals and large or monocrystals. Two different structural states were compared. Evidence was found for the determinant action of the environment, especially water vapor, related to the role played by cleavage in propagation mechanisms. ESRO

N75-14876 Ugine Aciers, Ugine (France).
PLASTICITY OF TITANIUM ALLOYS. HAMMER HARDENING AND RECRYSTALLIZATION OF TA6V AT TEMPERATURES NEAR ALPHA AND BETA TRANSITION POINT Final Report [PLASTICITE DES ALLIAGES DE TITANE: ECROUISSAGE ET RECRISTALLISATION DU TA6V AUX TEMPERATURES VOISINES DU POINT DE TRANSFORMATION REVERSIBLE DE ALPHA ET BETA EN BETA]
B. deGelas Dec. 1972 38 p refs In FRENCH
(Contract DGRST-71-7-2770)
Avail: Issuing Activity

Phase transitions of TA6V titanium alloy were studied after thermomechanical deformation and annealing by micrography and radiocrystallography. Thermomechanical (tensile and compression) stresses were applied with an especially devised programmable testing machine. The significance of these tests was confirmed by a metallurgical study of the alloy's transformation during industrial treatment. ESRO

N75-14877*# Kanner (Leo) Associates, Redwood City, Calif.
OXIDE FILMS ON GOLD ELECTRODES
L. Kekedy and A. Popescu Washington NASA Jan. 1975 27 p refs Transl. into ENGLISH from Stud. Cercet. Chim. (Bucharest), v. 22, no. 6, 1974 p 685-700
(Contract NASw-2481)
(NASA-TT-F-16123) Avail: NTIS HC $3.75 CSCL 11F

The literature on the formation of oxide films on gold electrodes under various conditions is reviewed. Experimental data are presented as well as data on the nature of these films, methods of pretreatment and applications. Author

N75-14878*# Kanner (Leo) Associates, Redwood City, Calif.
CATHODIC PROTECTION
Washington NASA Oct. 1974 15 p Transl. into ENGLISH of "Protection Cathodique", Serv. du Transport d'Energie, YM/JB-87-D f-42, 25 May 1971 6 p
(Contract NASw-2481)
(NASA-TT-F-15984; YM/JB-87-D f-42) Avail: NTIS HC $3.25 CSCL 11C

The effectiveness of the cathodic protection used to shield the Rance River tidal power plant's submerged metal parts from corrosion, decreasing the necessity for repainting is documented.

The basic principles of cathodic protection are given briefly, followed by a more detailed description of how it is used on the Rance River equipment. Author

N75-14879# Royal Aircraft Establishment, Farnborough (England).
FRACTURE TOUGHNESS INVESTIGATIONS OF A TITANIUM ALLOY
F. Link and D. Munz Oct. 1974 19 p refs Transl. into ENGLISH from Materialpruefung (Duesseldorf), v. 13, no. 12, 1971 p 407-412
(RAE-Lib-Trans-1806; BR44281) Avail: NTIS HC $3.25

Fracture toughness in specimens of medium size was determined by investigating the onset of crack growth in the center of the specimens. For the titanium alloy TiAl6V4 crack growth was determined by the load-displacement curve according to the method of repeated loading and unloading, by the potential method, and by the appearance of the fracture surfaces. With these methods it was proved that the onset of crack growth starts at a stress intensity factor 30% less than the fracture toughness value, which was determined according to the secant method of the ASTM recommendation. Author

N75-14880# Royal Aircraft Establishment, Farnborough (England).
THE PLASTIC ZONE AT FATIGUE CRACKS IN PURE ALUMINIUM
K.-H. Schwalbe Oct. 1974 24 p refs Transl. into ENGLISH from Z. Metallkunde, (West Germany) v. 62, no. 1, 1971 p 59-67
(RAE-Lib-Trans-1792; BR44279) Avail: NTIS HC $3.25

Fatigue crack propagation in pure single and polycrystalline aluminum were observed and compared with the shear stress distribution at the tip of the crack. It is shown that crack propagation is characterized initially by a state of plane strain and then by a state of plane stress. These ranges of crack propagation were correlated with characteristic sections on the fracture surface. The extent of the plastic zone was estimated based upon the elastic shear stress-field. The good agreement with the measurements appears to justify the reasoning upon which the estimate is based. In single crystals the plastic zone is shaped asymmetrically. This effect is caused by the activation of different types of slip planes on both sides of the crack. This observation is interpreted qualitatively in terms of the shear stress distribution. Author

N75-14881# National Research Council of Canada, Ottawa (Ontario).
A THERMODYNAMIC STUDY OF THE IRON-NICKEL-OXYGEN SYSTEM
K. Ono, K. Yokogawa, A. Yamaguchi, and J. Moriyama 1974 17 p refs Transl. into ENGLISH from Nippon Kinzoku Gakkaishi (Sendai), v. 8, no. 35, 1971 p 750-756
(NRC-TT-1773) Avail: NTIS HC $3.25

The isothermal sections of the iron-nickel-oxygen system at 757 C, 900 C and 1050 C were defined by determining the relationship between oxygen pressure, temperature and composition using thermogravimetry and X-ray techniques. The phase boundaries of the three-phase fields, wustite-alloy-spinel and spinel-nickel oxide-alloy were investigated in detail at 1050 C. Using available disorder model and oxygen pressure dependence of composition observed in this investigation, the disorder structures were discussed for nickel ferrite ($Ni_2Fe_3O_4$). The activity of iron in austenitic iron-nickel alloy was studied by means of the two-phase fields, ferrite-alloy and wustite-alloy. The solid solutions studied exhibit negative deviation from Raoult's law nearly at the composition $FeNi_3$. Author

N75-14882*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
GROWTH DEFECTS IN THICK ION-PLATED COATINGS
Talivaldis Spalvins Washington Jan. 1975 12 p refs
(NASA-TN-D-7895; E-8130) Avail: NTIS HC $3.25 CSCL 11F

Industrial ion plating conditions were selected tot deposit metallic coatings such as copper, gold, and chromium > 2 micrometer thick on metal and glass substrates. The surface finishes of 304 stainless steel, copper, and brass were utilized with mechanically and electrolytically polished surfaces. Nodular growth occurred in these coatings during ion plating as revealed by scanning electron microscopy. Surface irregularities such as scratches, steps, ledges, and so forth are responsible for outward growth, the typical cone type, whereas surface contaminants and loosely settled foreign particles are responsible for lateral growth; namely, the extreme localized surface outgrowths. These defect crystallographic features create porosity in the coatings when subjected to stresses and strains. Author

N75-14883*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECTS OF ALLOY COMPOSITION IN ALLEVIATING EMBRITTLEMENT PROBLEMS ASSOCIATED WITH THE TANTALUM ALLOY T-111
Joseph R. Stephens Washington Jan. 1975 40 p refs
(NASA-TN-D-7838; E-7880) Avail: NTIS HC $3.75 CSCL 11F

The causes of aging embrittlement in T-111 (Ta-8W-2Hf) and the effect of alloy modification were investigated. Results show that T-111 possesses a critical combination of tungsten and hafnium that leads to loss in ductility at -196 C after aging near 1040 C. It was found that this occurs because tungsten enhances hafnium segregation to grain boundaries, which also leads to increased susceptibility to hydrogen embrittlement. Aging embrittlement was not observed in tantalum alloys with reduced tungsten or hafnium contents; most of the alloys studied have lower strengths than T-111 and exhibit susceptibility to hydrogen embrittlement. Author

N75-14884*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EMBRITTLEMENT OF NICKEL-, COBALT-, AND IRON-BASE SUPERALLOYS BY EXPOSURE TO HYDROGEN
Hugh R. Gray Washington Jan. 1975 46 p
(NASA-TN-D-7805; E-8020) Avail: NTIS HC $3.75 CSCL 11F

Five nickel-base alloys (Inconel 718, Udimet 700, Rene 41, Hastelloy X, and TD-NiCr), one cobalt-base alloy (L-605), and an iron-base alloy (A-286) were exposed in hydrogen at 0.1 MN/sq m (15 psi) at several temperatures in the range from 430 to 980 C for as long as 1000 hours. These alloys were embrittled to varying degrees by such exposures in hydrogen. Embrittlement was found to be: (1) sensitive to strain rate, (2) reversible, (3) caused by large concentrations of absorbed hydrogen, and (4) not associated with any detectable microstructural changes in the alloys. These observations are consistent with a mechanism of internal reversible hydrogen embrittlement. Author

N75-14885*# Scientific Translation Service, Santa Barbara, Calif.
PREPARATION OF SINTERED OXIDES WITH HOLLANDITE TYPE STRUCTURE K(x)Mg(x)/2Ti8(x)/2O16 AND THEIR IONIC CONDITION
Takehiko Takahashi and Katsumi Kuwabara Washington NASA Jan. 1975 14 p refs Transl. into ENGLISH from J. Chem. Soc. Jap., Ind. Chem. Sect. (Japan), no. 10, 1974 p 1883-1887
(Contract NASw-2483)
(NASA-TT-F-16098) Avail: NTIS HC $3.25 CSCL 11F

Ionic conduction in sintered oxides with hollandite type structure, which have tetragonal lattice and involve tunnels along the c axis, was investigated. Degree of sintering was defined by the ratio of apparent density of theoretical X-ray density. When K_2CO_3, MgO and TiO_2 were fired at 1200 C for 5 hr after prefiring at 950 C for 10 hr, the degree of sintering reached 85 to approximately 90%. From the results of the power X-ray diffractions, fluorescence X-ray analyses, and lattice constants, the composition range of tetragonal single phase was determined. The tablets of about 11 mm in diameter and 2 mm in thickness were prepared from the sintered single phase and their ac conductivities at 10 kHz were measured using a pair of gold plate electrodes in the temperature range from 200 C to 400 C. The species contributing to the ionic conduction in the sintered specimens of single phase was clarified to be potassium ion. Author

N75-14886*# Scientific Translation Service, Santa Barbara, Calif.
THE DIFFERENT TYPES OF CORROSION PROTECTION USED AT THE RANCE TIDAL-POWER STATION
Jacques Lefrancois Washington NASA Jan. 1975 36 p Transl. into ENGLISH from the French Presented at the Colloq. Intern. Cefracor 74, La Baule, France, 4-7 Jun. 1974
(Contract NASw-2483)
(NASA-TT-F-16101) Avail: NTIS HC $3.75 CSCL 07A

Cathodic protection used in conjunction with paints and metallizations has been very effectiive in controlling corrosion of submerged metallic structures at a tidal power plant. Author

N75-14887*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THERMAL FATIGUE RESISTANCE OF NASA WAZ-20 ALLOY WITH THREE COMMERCIAL COATINGS
Peter T. Bizon and Robert E. Oldrieve Washington Jan. 1975 27 p refs
(NASA-TM-X-3168; E-8060) Avail: NTIS HC $3.75 CSCL 11F

Screening tests using three commercial coatings (Jocoat, HI-15, and RT-1A) on the nickel-base alloy NASA WAZ-20 were performed by cyclic exposure in a Mach 1 burner facility. These tests showed Jocoated WAZ-20 to have the best cracking resistance. The thermal fatigue resistance of Jocoated WAZ-20 in both the random polycrystalline and directionally solidified polycrystalline forms relative to that of other superalloys was then evaluated in a fluidized-bed facility. This investigation showed that Jocoated random polycrystalline WAZ-20 ranked approximately in midrange in thermal fatigue life. The thermal fatigue life of directionally solidified Jocoated WAZ-20 was shorter than that of other directionally solidified alloys but still longer than that of all alloys in the random polycrystalline form. Author

N75-14888*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ROLE OF ELECTRON CONCENTRATION IN SOFTENING AND HARDENING OF TERNARY MOLYBDENUM ALLOYS
Joseph R. Stephens and Walter R. Witzke Washington Jan. 1975 23 p refs
(NASA-TN-D-7893; E-8101) Avail: NTIS HC $3.25 CSCL 11F

Effects of various combinations of hafnium, tantalum, rhenium, osmium, iridium, and platinum in ternary molybdenum alloys on alloy softening and hardening were determined. Hardness tests were conducted at four test temperatures over the temperature range 77 to 411 K. Results showed that hardness data for ternary molybdenum alloys could be correlated with anticipated results from binary data based upon expressions involving the number of s and d electrons contributed by the solute elements. The correlation indicated that electron concentration plays a dominant role in controlling the hardness of ternary molybdenum alloys. Author

N75-14889*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
INVESTIGATION OF THE OXIDATION BEHAVIOR OF DISPERSION STABILIZED ALLOYS WHEN EXPOSED TO A DYNAMIC HIGH TEMPERATURE ENVIRONMENT Final Report
D. R. Tenney [1974] 45 p refs
(Grant NGR-47-004-082)
(NASA-TM-X-72180) Avail: NTIS HC $3.75 CSCL 11F

The oxidation behavior of TD-NiCr and TD-NiCrAlY alloys have been studied at 2000 and 2200 F in static and high speed flowing air environments. The TD-NiCrAlY alloys preoxidized to produce an Al2O3 scale on the surface showed good oxidation resistance in both types of environments. The TD-NiCr alloy which had a Cr2O3 oxide scale after preoxidation was found to oxidize more than an order of magnitude faster under the dynamic test conditions than at comparable static test conditions. Although Cr2O3 normally provides good oxidation protection, it was rapidly lost due to formation of volatile CrO3 when exposed to the high speed air stream. The preferred oxide arrangement for the dynamic test consisted of an external layer of NiO with a porous mushroom type morphology, an intermediate duplex layer of NiO and Cr2O3, and a continuous inner layer of Cr2O3 in contact with the alloy substrate. An oxidation model has been developed to explain the observed microstructure and overall oxidation behavior of all alloys. Author

N75-14890# Los Alamos Scientific Lab., N.Mex.
U-0.83 WT PERCENT Ti ALLOY: COOLING RATES OF GAMMA-QUENCHED ALLOY, RESULTING MICROSTRUCTURE AND RESPONSE TO AGING
C. A. Javorsky Mar. 1974 13 p
(Contract W-7405-eng-36)
(LA-5442-MS) Avail: NTIS HC $3.25

Samples from a U-0.83 wt % Ti alloy were subjected to various cooling rates, and response to subsequent aging was investigated. By a suitable choice of quenching media, cooling rates were varied from 3.9 to 190 C/s. Resulting as-quenched microstructures and hardnesses were not a function of cooling rates when rates were greater than 40 C/s. Aging treatments were monitored by metallographic observations and hardness measurements, and cooling rates greater than 40 C/s produced no relative changes in aging response. Tensile properties of selected quenched and aged specimens are the basis for concluding that strength and ductility are unaffected by cooling rate. Author (NSA)

N75-14891# Army Foreign Science and Technology Center, Charlottesville, Va.
PRINCIPLES OF FORMATION OF ATOMIC VAPOR IN A THERMIONIC CATHODE
G. V. Trishin, V. N. Morozov, and S. A. Shipitsyn 13 May 1974 10 p refs Transl. into ENGLISH from Zh. Strukt. Khim. (USSR), v. 17, no. 3 1972 p 399-402
(AD-784747; FSTC-HT-23-399-74) Avail: NTIS CSCL 07/4

The kinetics of formation of the atomic vapors of silver in a cylindrical nickel thermionic cathode were investigated under various conditions. Intensity of the 3280.7 A silver line was used to determine atomic silver vapor concentrations. Using electroplated metallic silver, AgNo3 and AgCl, the latter with and without metallic lead and metallic bismuth, it was found that the silver vapor concentration was increased by reduction in the partial pressure of chlorine, through a substitution reaction between metallic lead or bismuth and AgCl, with a burst in intensity occurring in the silver emission line at the boiling temperature of the metal. GRA

N75-14892# Notre Dame Univ., Ind. Dept. of Metallurgical Engineering and Materials Science.
GAMMA-IRRADIATION DAMAGE IN AGE HARDENING Al ALLOYS Final Report
Nicholas F. Fiore Jul. 1974 44 p refs
(Contract DAAD05-70-C-0085)
(AD-786578; BRL-CR-167) Avail: NTIS CSCL 11/6

Pure Al and a series of age-hardenable Al alloys have been gamma-irradiated in a Co60 source at a dose of 6000 rads/min. Internal friction measurements have been made at 80 kHz by means of the Marx technique on samples in situ during irradiation. In Al and Al-3 w/o Cu, the damping decreases monotonically as is expected. The decrease is attributed to the immobilization of dislocations by the radiation-induced point defect pinners. In 2024-T6, 2017-T6 and A1-9.5 Mg, the damping passes through a minimum and begins an anomalous increase after 4 to 7 hours of irradiation. In the alloys which display the damping minimum, precipitate morphology changes during irradiation, with coarsening and/or de-coarsening and re-nucleation being observed. The effect appears to depend upon the presence of Mg. Theory predicts that morphology changes can occur during gamma-irradiation, with the mechanism being either Rutherford collision or Coulombic repulsion radiation damage. (Modified author abstract) GRA

N75-14893# Army Foreign Science and Technology Center, Charlottesville, Va.
STRUCTURE AND CHARACTERISTICS OF STEEL CHROMIUM PLATED IN A VACUUM
N. S. Gorbunov, E. P. Ponomarenko, and V. P. Khokhlov 29 Mar. 1974 15 p refs Transl. into ENGLISH from Nauchn. Dokl. na Soveshchanii po Probl. Struktura I Svoistva Zharoprochn. Metallich Marerialov (Moscow), 1970 p 79-89
(AD-785707; FSTC-HT-23-1279-73) Avail: NTIS CSCL 11/3

Steels of the type 10KP, 20, 30, and 35L were chromium

plated from the sublimated phase in a vacuum in a period of one to 15 hours. The 70% industrial ferrochrome Cr.00 was used in the spray. Through vacuum diffusion chromium plating, a diffused layer to a depth of 2 mm can be obtained on carbon steel for much higher operational characteristics than with 1KH13 steel, thus permitting carbon steel to be used instead of KH17N2 and KH18N9T steels. GRA

N75-14894# Waterloo Univ. (Ontario). Dept. of Civil Engineering.
SUBSTRUCTURAL DEVELOPMENT DURING STRAIN CYCLING OF ALPHA IRON Interim Report
O. K. Chopra and C. V. B. Gowda Jun. 1974 30 p refs
(Grant AF-AFOSR-2120-71; AF Proj. 9782)
(AD-785423; AFOSR-74-1354TR) Avail: NTIS CSCL 11/6

Substructural developments during reversed axial strain cycling of alpha iron have been studied at room temperature. The nature of the structure varied considerably at different stages of fatigue life. A distinct cell structure developed gradually with continued cycling and the average cell size decreased with increase in applied strain range. A large number of dislocation loops were observed near the regions of the cell walls and their density was higher in specimens cycled at a smaller strain range. Two step tests in which the specimens were cycled at an initial high strain range for a specified number of cycles followed by low strain range cycling showed that although the flow stress decreased rapidly the modification in the substructure was very slow. It is believed that although cross slip is responsible for the substructural development during room temperature fatigue, it is aided by dislocation climb. Author (GRA)

N75-14895# Watervliet Arsenal, N.Y. Benet Weapons Lab.
FATIGUE BEHAVIOR OF METAL LAMINATES
Joseph F. Throop and James J. Miller 1973 16 p refs
(AD-785690) Avail: NTIS CSCL 11/6

The main purpose of this investigation was to study the effects of the interfaces in metallic laminates upon fatigue crack propagation and fracture resistance in order to exploit any crack retardation effects and to enable the prevention of crack acceleration effects. This is the report of exploratory experimental studies of the behavior of AISI 1018 steel laminates and 6061-T6 structural aluminum alloy laminates using 1-inch thick ASTM compact specimens (1) for fatigue crack growth and fracture tests. This study is concerned with the fatigue damage tolerance and fracture resistance in bonded metal laminates. GRA

N75-14896# Army Foreign Science and Technology Center, Charlottesville, Va.
IMPROVING THE QUALITY AND VARIETY OF ROLLED METAL
N. L. Sheftel May 1974 59 p Transl. into ENGLISH from an unidentified Russian monograph
(AD-786825; FSTC-HT-23-0340-74) Avail: NTIS CSCL 11/6

The excerpts translated from a book on improving the quality and variety of rolled metals include the provisions of the current five-year plan for ferrous metallurgy. They encompass new production methods for improved quality and variety, new construction and research. The new refining methods discussed are electro-slag, electron beam, plasma-arc, vacuum arc. Comparisons of metals produced by these methods are made with each other and with ordinary refining methods. The last section covers the basic trends in standardization of metal production. GRA

N75-14897# Army Foreign Science and Technology Center, Charlottesville, Va.
SCIENCE AND TECHNICAL PROGRESS IN NONFERROUS METALLURGY
P. F. Lomako Nov. 1973 23 p Transl. into ENGLISH from an unidentified Russian monograph
(AD-786796; FSTC-HT-23-0319-74) Avail: NTIS CSCL 11/6

The attainments of science in the field of non-ferrous metallurgy are discussed. The basic results of work in branches for 1966-1970 and for the first year of the ninth Five-year Plan are given. The book covers questions of adopting new processes and equipment, automated control systems, standardization, perfecting the technology of production of non-ferrous and rare metals and semiconductor materials, and improving the qualifications of cadres. GRA

N75-14898# Army Foreign Science and Technology Center, Charlottesville, Va.
STUDY OF THE DIFFUSION OF ANTIMONY IN BISMUTH TELLURIDE SINGLE CRYSTALS AS A FUNCTION OF THE COMPOSITION
A. A. Bekker, A. N. Krestovnikov, A. N. Nesmeyanov, L. M. Romantseva, and M. I. Tsypin 22 Feb. 1974 7 p refs Transl. into ENGLISH from Vestn. Mosk. Univ., Ser. 2: Khim. (USSR), v. 13, no. 2, Mar./Apr. 1972 p 239-240
(AD-785881; FSTC-HT-23-1532-73) Avail: NTIS CSCL 20/12

Single crystals of bismuth telluride were prepared, and antimony was applied onto their surfaces by vacuum deposition. After homogenizing, the depth of penetration of the antimony into the crystals was determined by the changes in the thermo-emf along the diffusion path. The coefficient of diffusion of antimony was greatest for nearly stoichiometric compositions. The diffusion of antimony in two mutually perpendicular directions with respect to the basal plane had a considerable anisotropy, the magnitude of which was greatest in the p-type specimens. GRA

N75-14899# Sage Action, Inc., Ithaca, N.Y.
DEVELOPMENT AND TEST OF A TECHNIQUE TO CREATE LIQUID SUSPENSIONS OF SUB-MICRON METALLIC PARTICLES Technical Report, 1 Apr. 1971 - 31 Mar. 1973
R. W. Hale, D. E. Ordway, and P. Tan Dec. 1973 33 p refs
(Contract N00014-69-C-0170; NR Proj. 215-042)
(AD-786233; SAI-RR-7301; TR-3) Avail: NTIS CSCL 07/1

An investigation has been carried out to find a practical way to create liquid suspensions of sub-micron metallic particles. Particles of suitable size and purity were produced by a technique developed at Oak Ridge National Laboratory using the Exploding Wire Aerosol Generator (EWAG). To introduce the particles from the resulting aerosol into a liquid, a prototype Particle Transfer Device (PTD) was devised and constructed. This device uses a unique Collimated Hole Structure (CHS) to form large quantities of tiny bubbles within the liquid. Capture of the particles within these bubbles is by diffusion to the bubble walls. Initial qualification tests substantiated the concept, but the efficiency was quite low because of unanticipated electrical effects. Corrective actions are suggested which may enable the full potential of the concept to be realized. Author (GRA)

N75-14900# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Metallurgy and Materials Science.
TRANSFORMATION CHARACTERISTICS OF QUATERNARY URANIUM-BASE ALLOYS Final Report
D. E. Blake and R. F. Hehemann Jul. 1974 67 p refs
(Contract DAAG46-73-C-0130)
(AD-786668; AMMRC-CTR-74-51) Avail: NTIS CSCL 11/6

The transformation characteristics of quaternary uranium-base alloys containing small, equal amounts (K) of molybdenum, niobium, and zirconium with 0.5 weight percent titanium were examined by dilatometric, hardness, metallographic and X-ray diffraction techniques. Principal emphasis was placed on isothermal transformation of an alloy with K = 1.5%. Quench-ageing treatments of this alloy as well as isothermal transformation of an alloy with K = 0.75% were studied less extensively. (Modified author abstract) GRA

N75-14901# Bureau of Mines, Albany, Oreg. Metallurgy Research Center.
PIONEERING EXPERIMENTS ON THE COREDUCTION OF TITANIUM, ALUMINUM, AND VANADIUM CHLORIDES TO PRODUCE TITANIUM ALLOY SPONGE
Jack L. Henry, Wallace E. Anable, and John L. Schaller Jul. 1974 27 p refs
(PB-234693/0; BM-RI-7934) Avail: NTIS HC $3.75 CSCL 11F

Experiments were conducted in a 12-inch diameter Kroll reduction reactor to examine the feasibility of coreducing the chlorides of titanium, aluminum, and vanadium to produce a homogeneous titanium alloy sponge. Vanadium concentration was very uniform throughout the sponge cake when VCl4 was fed into the molten magnesium. Difficulty was encountered in

feeding solid VCl2 and solid AlCl3. Vanadium and aluminum concentration in the sponge was not uniform and mechanical difficulties were experienced with the small-scale screw feeder. Although the sponge varied in composition from region-to-region the ingots prepared from it were uniform in composition. GRA

N75-14902# British Steel Corp., Sheffield (England). Information Services.
THE USE OF RARE EARTH METALS IN THE PRODUCTION OF HIGH QUALITY PLATE STEELS
W. J. M. Henderson and J. A. Chapman Jun. 1974 11 p refs
(PB-234303/6; GS/OPER/MISC/73/74/C) Avail: NTIS HC $3.25 CSCL 11F

The use of rare earth metals in the production of high quality plate steels is reviewed. The factors affecting the precipitation of sulphide inclusions in rare earth free and rare earth treated steels are discussed and the production route for linepipe steels is outlined. Details are given of desulphurization of iron and steel, rare earth metal addition rates and techniques and the resultant effect on mechanical properties. GRA

N75-14903# Ohio State Univ. Research Foundation, Columbus.
DEVELOPMENT OF A DESIGN HANDBOOK ON STRESS-CORROSION CRACKING Semiannual Report, 15 Dec. 1973 - 15 May 1974
Roger W. Staehle and Markus O. Speidel Sep. 1974 25 p refs
(Contract N00014-67-A-0232; ARPA Order 2616)
(AD-787140; OSURF-3875-1) Avail: NTIS CSCL 11/6

Significant progress has been made in compiling the data base from which the contents of the handbook on stress corrosion cracking will be extracted. In the first effort, extensive computerized literature searches were done. A second effort to collect available information on stress corrosion cracking was undertaken by contacting in writing more than two hundred recognized specialists active in this field. Early results of these efforts are presented. Author (GRA)

N75-14774 National Aeronautical Establishment, Ottawa (Ontario). Structures and Materials Lab.
PREDICTION OF SIGMA PHASE FORMATION IN HIGH TEMPERATURE ALLOYS
W. Wallace *In its* Sigma Phase Formation in High Temp. Alloys and Response Rate of Gas Turbines 30 Sep. 1974 p 1-21 refs (For availability see N75-14773 06-09)

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N75-14904 Omnium de Prospective Industrielle, Neuville-Saint-Amand (France).
STUDY OF DISSOLVED GAS EXCHANGE THROUGH SEMIPERMEABLE ANISOTROPIC MEMBRANES Final Report [ETUDE DES ECHANGES DE GAZ DISSOUS AU TRAVERS D'UNE MEMBRANE ANISOTROPE SEMI-PERMEABLE]
Michel Lefebvre, Christian Miquel, and Christiane Tavernier Dec. 1973 22 p refs In FRENCH
(Contract DGRST-71-7-3100)
Avail: Issuing Activity

Polyamide membranes exhibiting transfer anisotropy towards O2 and CO2 dissolved in liquid media were prepared. Gaseous transport takes place solely by diffusion through the liquid contained in the pores and not through the polyamide. Permeability coefficients and porosity indexes were measured and effects of manufacturing on porosity investigated. Several applications to medical and industrial filtration and ultrafiltration problems are envisaged. ESRO

N75-14905 Rhone-Progil, Decines (France).
IMPROVEMENT OF COMPOSITE PROPERTIES BY SURFACE TREATMENT OF FILLERS Final Report [ETUDE DES AMELIORATIONS APPORTEES AUX PROPRIETES DES COMPOSITES PAR DES TRAITEMENTS DE SURFACE DES CHARGES]
Rieux, Coudurier, and M. Guillet Oct. 1973 20 p In FRENCH
(Contract DGRST-70-02-241)
Avail: Issuing Activity

Surface properties of silica and alumina fillers were modified by reaction with isocyanates and carbodiimides and by cationic grafting of macromolecular chains. Organophylic treatment of fillers enhances the adhesive properties of epoxy resin composites used for metal bonding. Improved wetting of metal surface seems to be brought about by modification of the rheological properties of composites. Elastomer grafted silica fillers were incorporated in elastomers, but no significant difference in mechanical properties appeared except in the case of resistance to tearing. ESRO

N75-14906 Centre d'Etudes et Recherches des Charbonnages de France, Creil.
REINFORCING OF THERMOSETTING MATRICES WITH CARBON FIBERS OBTAINED FROM COAL TAR Final Report [ETUDE DU RENFORCEMENT DE MATRICES THERMO-DURCISSABLES PAR DES FIBRES DE CARBONE DERIVEES DE BRAI DE HOUILLE]
P. Chiche, G. Dupupet, C. Martin (Inst. Natl. de Rech. Chim. Appl.), I. Mantin (Inst. Natl. de Rech. Chim. Appl.), J. M. Dartyge (Inst. Natl. de Rech. Chim. Appl.), Lan Nog-Kim (Inst. Natl. de Rech. Chim. Appl.), A. Saint-Yrieix (Inst. Natl. de Rech. Chim. Appl.), and C. Ferrieres (Inst. Natl. de Rech. Chim. Appl.) Feb. 1974 51 p refs In FRENCH
(Contract DGRST-72-7-0142)
Avail: Issuing Activity

The effect of superficial oxidation by air or by sodium hypochlorite solutions on carbon fibers obtained from coal pitch was studied with a view to improving their adhesivity to a thermosetting epoxy resin matrix. Resin impregnation of carbon fibers was also investigated. Surface treated specimens were examined by electron microscopy. Hypochlorite oxidation at 80 C for two hours enhanced the shear strength of the composite by a factor of two or three. These composites show interesting conductivity and auto-lubricant properties. ESRO

N75-14907*# Massachusetts Inst. of Tech., Cambridge.
INDIUM ANTIMONIDE CRYSTAL GROWTH EXPERIMENT M562 Final Report
Harry C. Gatos and August F. Witt Sep. 1974 80 p refs
(Contract NAS8-28306)
(NASA-CR-120558) Avail: NTIS HC $4.75 CSCL 20B

It was established that ideal diffusion controlled steady state conditions, never accomplished on earth, were achieved during the growth of Te-doped InSb crystals in Skylab. Surface tension effects led to nonwetting conditions under which free surface solidification took place in confined geometry. It was further found that, under forced contact conditions, surface tension effects led to the formation of surface ridges (not previously observed on earth) which isolated the growth system from its container. In addition, it was possible, for the first time, to identify unambiguously: the origin of segregation discontinuities associated with facet growth, the mode of nucleation and propagation of rotational twin boundaries, and the specific effect of mechanical-shock perturbations on segregation. The results obtained prove the advantageous conditions provided by outer space. Thus, fundamental data on solidification thought to be unattainable because of gravity-induced interference on earth are now within reach. Author

N75-14908*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PHYSICAL PROPERTY MEASUREMENTS OF DOPED CESIUM IODIDE CRYSTALS
R. S. Synder and W. N. Clotfelter 30 Aug. 1974 28 p
(NASA-TM-X-64898) Avail: NTIS HC $3.25 CSCL 11B

Mechanical and thermal property values are reported for crystalline cesium iodide doped with sodium and thallium. Young's modulus, bulk modulus, shear modulus, and Poisson's ratio were obtained from ultrasonic measurements. Young's modulus and the samples' elastic and plastic behavior were also measured under tension and compression. Thermal expansion and thermal

conductivity were the temperature dependent measurements that were made. Author

N75-14909*# Midwest Research Inst., Kansas City, Mo.
REFLECTIVE SUPERINSULATION MATERIALS Final Report
Washington NASA Jan. 1975 34 p
(Contract NASw-2454)
(NASA-CR-2507) Avail: NTIS HC $3.75 CSCL 11D

Reflective superinsulation films are gradually being adapted for use in civilian thermal products. A wide range of their applications in emergency equipment and lightweight clothing is described. Author

N75-14910# Army Foreign Science and Technology Center, Charlottesville, Va.
ADHESIVES AND HERMATIC SEALS MADE OF SYNTHETIC MATERIALS, CHAPTER 13
E. I. Belskii, A. M. Dmitrovich, and E. B. Lozhechnikov 24 Jul. 1974 5 p Transl. into ENGLISH from the book "Novye Materialy v Tekhnike chap-13" Minsk, 1971 p 245-249
(AD-785986; FSTC-HT-23-1596-73) Avail: NTIS CSCL 11/1

The joining of metallic, wooden, silicate, and plastic parts by adhesives provides a sufficiently high strength bond, does not cause the cross section weakening that is characteristic of other forms of joining, and is comparatively inexpensive. A drawback of adhesive bonding is that it does not permit asymmetrical loads. Synthetic adhesives, as a rule, can be used as hermetic sealing materials. Adhesives and hermetic seals have various compositions. They are different in their reaction to thermal action, in solvent and filler content, in the properties of the basic polymer, etc. Author

N75-14911# Alabama Univ., University. Dept. of Chemistry.
SYNTHESIS OF ORGANOMETALLIC SEMICONDUCTING POLYMERS AND METAL CARBONYL POLYMERS Final Report, 1 Jan. 1971 - 26 Jan. 1974
Charles U. Pittman, Jr. 16 Mar. 1974 45 p refs
(Contract F19628-71-C-0107; AF Proj. 8659)
(AD-786480; AFCRL-TR-74-0216) Avail: NTIS CSCL 07/3

The synthesis of three classes of ferrocene polymers was accomplished. Mixed oxidation state polymers were then prepared from each by oxidizing the polymers with dichlorodicyanoquinone, chloranil, picrate, BF4(-), tetracyanoquinodimethan, and I3(-) salts. Conductivities were measured and studied as a function of (1) the ferrocene/ferrocenium ratio and (2) the counterion. Polymers containing metal carbonyl functions were prepared. These were effective heterogenized, homogeneous catalysts. Bound isomerization, hydroformylation, and cyclooligomerization catalysts were prepared. A number of organometallic copolymers was made. Thermal and photochemical decomposition of metal-carbonyl-containing polymers released tiny metal oxide polymers within films. Volatile organocopper compounds for laser use were made. (Modified author abstract) GRA

N75-14912# Carborundum Co., Niagara Falls, N.Y.
PREPARATION AND PROPERTIES OF FINE DIAMETER MULTIFILAMENT NIOBIUM CARBONITRIDE SUPERCONDUCTING FIBERS Final Technical Report, 1 Apr. 1973 - 31 Mar. 1974
Ruey Y. Lin, William D. Smith, John Coppola, and James Economy Jun. 1974 73 p refs
(Contract F33615-73-C-5110; AF Proj. 7371)
(AD-786031; AFML-TR-74-113) Avail: NTIS CSCL 20/1

This report summarizes the development efforts on niobium carbonitride yarn. The preparation was accomplished by reacting the carbon fiber precursor with niobium pentachloride in the presence of hydrogen and nitrogen at 1500 to 1600C for 2 to 6 minutes. The reacted yarn was quenched from the reaction temperature to about 200C to retain the niobium carbonitride phase. These fibers display excellent superconducting properties. A post treatment with ammonia was found to cause a composition change yielding a nitrogen rich product via a further nitriding process. The critical current and current density of the typical products were increased. Silicon dopant was found to be effective in improving the critical current at high magnetic fields. Improvement in electrical contact between the superconductor and copper coating was accomplished by a post coating heat treatment in the temperature range of 600 to 1000C in the inert atmosphere. (Modified author abstract) GRA

N75-14913# General Electric Co., Schenectady, N.Y. Research and Development.
IMPACT RESPONSE CHARACTERISTICS OF POLYMERIC MATRICES Final Report, 12 Jan. 1973 - 11 Sep. 1974
William B. Hillig Sep. 1974 114 p refs
(Contract N00019-73-C-0282)
(AD-786771; SRD-74-087) Avail: NTIS CSCL 11/9

The basic response of polymethylmethacrylate (PMMA), polycarbonate (PC), and epoxy to impact was studied. Aims included: (1) obtaining reliable base data over as wide a range of impact velocities as feasible; (2) analyzing the response into time-dependent (relaxation) and strain-dependent (elastic, plastic) components; (3) determining the role of the indenter/projectile geometry on the response by using conical as well as spherical shapes; (4) exploring theoretically the effect of large deformations; (5) determining the effect of temperature; (6) producing a phenomenological description of the impact response; (7) providing insight into the basic phenomena involved. An equation of state for each material was deduced which permits calculation of the force/indentation response over the range of conditions explored. The effect of temperature changes over the range 20 to 40C were determined for PMMA and PC. The results are discussed and suggestions offered for further studies. (Modified author abstract) GRA

N75-14914# Minnesota Univ., Minneapolis. Dept. of Aeronautics and Engineering Mechanics.
FUNCTIONING OF THE OMEGA SENSOR ON TEXTILE SAMPLES UNDER HIGH LOADING RATES Final Report, Jul. 1973 - May 1974
H. G. Heinrich and R. A. Noreen Sep. 1974 33 p refs
(Contract F33615-73-C-3149; AF Proj. 6065)
(AD-786029; AFFDL-TR-74-78) Avail: NTIS CSCL 11/5

The Omega sensor was developed for measuring stress in textile and other flexible materials. As a first application, it was intended to measure stresses in the material of parachute canopies. In an earlier study, it was found that circumferential stresses of inflated parachute canopies indicated by Omega sensors agreed with theoretically predicted stresses. The question then arose whether or not sensor indicated stresses are realistic under a high rate of loading, since it is known that the strain of nylon and other textile materials varies with the rate of loading. This study investigates this question and no dynamic effects upon the Omega sensor or the indicated stresses were found. (Modified author abstract) GRA

N75-14915# Bureau of Mines, Bartlesville, Okla. Energy Research Center.
WASTE LUBRICATING OIL RESEARCH. SOME INNOVATIVE APPROACHES TO RECLAIMING USED CRANKCASE OIL
M. L. Whisman, J. W. Goetzinger, and F. O. Cotton Jul. 1974 24 p refs
(PB-234685/6; BM-RI-7925) Avail: NTIS HC $3.25 CSCL 11H

The Bureau of Mines developed and tested in the laboratory several innovative techniques for reclaiming used lubricating oil. These processes included percolation through both chemically treated clay and ion-exchange resins, distillation through batch and continuous wiped wall vacuum apparatus, treatment with solvent extraction systems, and chemical removal of impurities with chelating agents. In each treatment, the criteria of evaluation were oil recovery and reduction of acidic and metallic components. Both vacuum distillation and solvent treatment ranked high in their abilities to remove acidic and metallic components of the used oil with good oil recoveries. A combination of the two techniques gave the best overall results in terms of quality evaluations made by established bench tests. The methods were not ranked according to economic practicability. Author (GRA)

N75-14916# National Materials Advisory Board, Washington, D.C.
AEROSPACE STRUCTURAL ADHESIVES Final Report
Jul. 1974 299 p refs
(Contract MDA903-74-C-0167)

(AD-787040; NMAB-300) Avail: NTIS CSCL 11C

A study has been made of problems associated with use of aerospace structural adhesives. Consideration is given to the state of the art and future needs in synthesis and formulation of adhesives. The role of interfaces is discussed from a physical chemical point of view. Manufacturing and processing aspects of adhesive use are considered. Data and theory are given for mechanical behavior, permanence, and related areas. Problems of design analysis, specification, and test methods are taken up. Performance, reliability, strategies, and future applications conclude this study. (Modified author abstract) GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N75-14917*# California Univ., Livermore. Lawrence Livermore Lab.

INVESTIGATION OF MATTER-ANTIMATTER INTERACTION FOR POSSIBLE PROPULSION APPLICATIONS

David L. Morgan, Jr. [1974] 31 p refs Prepared for JPL (Contract NAS7-100)

(NASA-CR-141356) Avail: NTIS HC $3.75 CSCL 21I

Matter-antimatter annihilation is discussed as a means of rocket propulsion. The feasibility of different means of antimatter storage is shown to depend on how annihilation rates are affected by various circumstances. The annihilation processes are described, with emphasis on important features of atom-antiatom interatomic potential energies. A model is developed that allows approximate calculation of upper and lower bounds to the interatomic potential energy for any atom-antiatom pair. Formulae for the upper and lower bounds for atom-antiatom annihilation cross-sections are obtained and applied to the annihilation rates for each means of antimatter storage under consideration. Recommendations for further studies are presented. N.E.R.

N75-14918# Ballistic Research Labs., Aberdeen Proving Ground, Md.

PROPELLANT ANALYSES, NEW APPROACHES, IMPROVED CAPABILITIES

Arpad A. Juhasz, J. Omar Doali, and Joseph J. Rocchio 1973 16 p refs

(AD-785641) Avail: NTIS CSCL 07/4

The combined use of high performance liquid chromatography with infrared and mass spectrometry (HPLC-IR-MS) and gas chromatography-mass spectrometry (GC-MS) is detailed. The application of these methods to the characterization of an unknown propellant sample is presented. Conclusions and recommendations are made concerning their application in other areas of propellant analysis. GRA

N75-14919# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.

AIRCRAFT TURBINE ENGINE FUEL CORROSION INHIBITORS AND THEIR EFFECTS ON FUEL PROPERTIES Final Technical Report

Charles R. Martel, Royce P. Bradley, James R. McCoy, and Joseph Petrarca Jul. 1974 42 p refs

(AF Proj. 3048)

(AD-787191; AFAPL-TR-74-20) Avail: NTIS CSCL 21/4

This report discusses the effects of corrosion inhibitors on the thermal stability, filterability, and lubricity of aircraft turbine engine fuels. (Modified author abstract) GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N75-14920# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

EXPERIENCE OF DEVELOPING FORECASTS OF TRENDS IN DEVELOPMENT OF CRYONICS

N. Stepanov 18 Sep. 1974 15 p Transl. into ENGLISH from the monograph "Teoriya i Praktika Prognozirovaniya Razvitiy a Nauki i Tekhniki v Stranakh-Chlenakh Sev" USSR, 1971 p 293-300

(AD-786918; FTD-HC-23-2365-74) Avail: NTIS CSCL 20/12

Cryonics has developed at the junction of solid-state physics, low-temperature physics and cryogenic technology. Among the variety of applications of superconductivity in the field of electronics, electrical engineering and machine building, the more promising are the four main trends: cryogenic memories, superconducting magnets, superconducting electric transmission lines, sensors and precision measuring devices. This paper discusses these trends. GRA

N75-14921# Naval Intelligence Support Center, Washington, D.C. Translation Div.

NEW SHIPBUILDING MATERIALS

L. Ya. Popilov 5 Jun. 1974 214 p refs Transl. into ENGLISH from the book "Novye Materialy dlya Sudostroeniya" Leningrad, 1969 p 329-343 and 388-543

(AD-785420; NISC-Trans-3550) Avail: NTIS CSCL 11/9

The report discusses plastics used in shipbuilding including new polymeric materials, epoxy resins, and reinforced plastics. Physical, mechanical, thermal, dielectric, and chemical properties are discussed. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N75-14922 British Broadcasting Corp., Kingswood (England). Research Dept.

THE SUBJECTIVE EFFECT OF INTERMODULATION DISTORTION WHEN SOUND AND VISION SIGNALS ARE AMPLIFIED IN A COMMON AMPLIFIER

P. Shelswell Oct. 1974 15 p refs

(BBC-RD-1974/35) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

An examination was made of the relationship between the subjective and objective effects of intermodulation impairments introduced into 625-line System 1 television systems, when sound and vision signals are amplified in a common amplifier. The variation of impairment with sound modulation is discussed. No consideration was given to the distortion of the sound channel or cross modulation. Author

N75-14923 British Broadcasting Corp., Kingswood (England). Research Dept.

A FIXED-TUNED MEDIUM-WAVE RECEIVER SUITABLE FOR A ROAD TRAFFIC INFORMATION SERVICE

D. E. Susans Oct. 1974 9 p refs

(BBC-RD-1974/36) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

A medium-wave fixed-tuned receiver intended for use in a motorcar for the reception of a road traffic information service is described. Its main features are long-term tuning stability, good automatic gain control over the working signal-level range, and a carrier-level-operated muting circuit to suppress the output on weak input signals. The receiver and loudspeaker are in a single unit. Author

N75-14924 British Broadcasting Corp., Kingswood (England). Research Dept.

DIGITAL VIDEO: SOME BIT-RATE REDUCTION METHODS WHICH PRESERVE INFORMATION IN BROADCAST-QUALITY DIGITAL VIDEO SIGNALS

D. F. Reid Oct. 1974 18 p refs

(BBC-RD-1974/37) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

The feasibility of reducing the bit-rate of digital video signals is investigated to determine a way that the original pulse code modulated digital signal can be recovered exactly. Reversible bit-rate reduction methods are described based on entropy considerations. A reversible system is discussed, postulating that the original signal can be retrieved and completely reconstructed. M.C.F.

N75-14925* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

AIR-TO-GROUND VOICE TRANSCRIPTIONS AND ON BOARD VOICE TRANSCRIPTIONS FOR SKYLAB 2, SKYLAB 3 AND SKYLAB 4

1974 15714 p

(NASA-TM-X-72205) Avail: NTIS in sets of 10 16mm microfilm reels or cartridges (specify type): Reel, N75-14925P, $42.00; 3M cartridge, N75-14925M, $62.00; Recordak cartridge, N75-14925R, $62.00; or Thread Easy Magazine, N75-14925T, $62.00 CSCL 17B

Microfilm records of the Skylab 2, 3, and 4 voice transcriptions are presented. The data are contained on ten 16 millimeter reels. The transcriptions are identified as air-to-ground communication and onboard communication. The Skylab 2 data are contained on one roll for air-to-ground and one roll for onboard communication. Skylab 3 data consist of two rolls for air-to-ground and two rolls for on board communication. Skylab 4 data consists of three rolls for air-to-ground and two rolls for onboard communication. P.N.F.

N75-14926*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

DATA-DERIVED SYMBOL SYNCHRONIZATION OF MASK AND QASK SIGNALS

Marvin K. Simon 15 Dec. 1974 87 p refs

(Contract NAS7-100)

(NASA-CR-141316; JPL-TM-33-720) Avail: NTIS HC $4.75 CSCL 17B

Multilevel amplitude-shift-keying (MASK) and quadrature amplitude-shift-keying (QASK) as signaling techniques for multilevel digital communications systems, and the problem of providing symbol synchronization in the receivers of such systems are discussed. A technique is presented for extracting symbol sync from an MASK or QASK signal. The scheme is a generalization of the data transition tracking loop used in PSK systems. The performance of the loop was analyzed in terms of its mean-squared jitter and its effects on the data detection process in MASK and QASK systems. Author

N75-14927# Boeing Commercial Airplane Co., Seattle, Wash.

ATS-5 MULTIPATH/RANGING/DIGITAL DATA L-BAND EXPERIMENTAL PROGRAM, SUMMARY Final Report, Apr. 1969 - Jul. 1973

Apr. 1973 153 p refs

(Contract DOT-FA69WA-2109)

(AD-783581; D6-60176; FAA-RD-73-57) Avail: NTIS HC $5.00 CSCL 17G

A summary description of an L-band multipath/ranging/digital data communication experimental program is given. Tests involved an FAA KC-135 jet airplane, the NASA ATS-5 satellite, the NASA/Rosman ground station, and the FAA NAFEC facility. All tests were conducted within the 1545- to 1655-MHz frequency band allocated for future aeronautical services. Tests included 30 overocean multipath and ranging flights in the North Altantic region, 16 digital data communication tests, eight overland multipath flights including both summer and winter conditions, six overocean multipath flights in the Pacific region, and nine fixed-link scintillation tests. Summary test results are presented and discussed relative to theoretical expectation. Author

N75-14928# Boeing Commercial Airplane Co., Seattle, Wash.

ATS-5 MULTIPATH/RANGING/DIGITAL DATA L-BAND EXPERIMENTAL PROGRAM. PHASE 1: EXPERIMENTAL PROGRAM-AIRCRAFT COMMUNICATIONS/SURVEILLANCE VIA SATELLITE AT L-BAND Final Report, 23 Apr. 1969 - 1 Jun. 1970

Apr. 1973 399 p refs

(Contract DOT-FA69WA-2109)

(AD-783582; D6-60177; FAA-RD-73-57-1) Avail: NTIS HC $8.50 CSCL 17G

A program definition study (phase 1) for an experimental flight test program intended to establish the capabilities and limitations of an L-band aeronautical satellite system has been completed. Three experiments are defined: aircraft position surveillance via satellite, voice and digital communications via satellite, and multipath propagation characterization. The test program was designed to use the NASA ATS-5 satellite, scheduled for launch in August 1969, and two FAA airplanes, a KC-135 and a DC-6B. Ground terminals were to be located at the NASA Mojave facility in California and at the FAA NAFEC facility near Altantic City, N.J. Descriptions of the aircraft experimental L-band antennas and functional requirements for the airborne and ground-based terminals are given. Due to failure of the ATS-5 satellite to achieve proper stabilization in orbit, the test program and hardware described herein were extensively revised prior to implementation and flight test as described in subsequent program phases. Author

N75-14929# Boeing Commercial Airplane Co., Seattle, Wash.

ATS-5 MULTIPATH/RANGING/DIGITAL DATA L-BAND EXPERIMENTAL PROGRAM. PHASE 2: TERMINAL DESIGN AND FLIGHT TEST PLAN FOR PHASE 1 PROGRAM. VOLUME 1: TERMINAL DESIGN Final Report, 1 Jul. 1969 - 1 Jun. 1970

Apr. 1973 108 p refs

(Contract DOT-FA69WA-2109)

(AD-783583; D6-60178-1-Vol-1; FAA-RD-73-57-2-Vol-1) Avail: NTIS HC $4.50 CSCL 17G

Airborne and ground station terminal designs for implementation of the phase I test plan are defined. Hardware configurations for the KC-135, DC-6B, and the NAFEC and Mojave ground terminals are described. Preliminary subsystem performance specifications, intended to form the basis for either in-house development or outside procurement, are given. Due to failure of the ATS-5 satellite to achieve proper stabilization in orbit, extensive program revisions occurred prior to the phase 4 flight test program. Only a few of the hardware items described herein were actually procured or fabricated, and the overall terminals were not implemented. Author

N75-14930# Boeing Commercial Airplane Co., Seattle, Wash.

ATS-5 MULTIPATH/RANGING/DIGITAL DATA L-BAND EXPERIMENTAL PROGRAM. PHASE 2: TERMINAL DESIGN AND FLIGHT TEST PLAN FOR PHASE 1 PROGRAM. VOLUME 2: FLIGHT TEST PLAN Final Report, 1 Jul. 1969 - 1 Jun. 1970

Apr. 1973 61 p refs

(Contract DOT-FA69WA-2109)

(AD-783652; D6-60178-2-Vol-2; FAA-RD-73-57-2-Vol-2) Avail: NTIS HC $3.75 CSCL 17B

Flight test requirements have been defined and integrated flight test schedules have been prepared for the voice/data communications, surveillance, and multipath propagation experiments defined in the test plan. A 6-month flight test program was assumed. Aircraft flightpaths and maneuvers, measurement station locations, satellite usage, and test procedures are given for each experiment. From these, integrated test schedules for the KC-135, DC-6B, and ATS-5 satellite were prepared. Due to failure of the ATS-5 satellite to achieve proper stabilization in orbit, the flight test requirements and schedules were extensively revised prior to the phase 4 flight test program. Author

N75-14931# Boeing Commercial Airplane Co., Seattle, Wash.

ATS-5 MULTIPATH/RANGING/DIGITAL DATA L-BAND EXPERIMENTAL PROGRAM. PHASE 3: DEFINITION OF REVISED EXPERIMENT, TERMINAL DESIGN, AND SUBSYSTEM PERFORMANCE CHARACTERISTICS Final Report, 1 Jun. 1970 - 1 Mar. 1971

Apr. 1973 115 p refs

(Contract DOT-FA69WA-2109)

(AD-783584; D6-60179; FAA-RD-73-57-3) Avail: NTIS HC $4.50 CSCL 17G

A revised overocean multipath propagation and CW tone-ranging flight test experiment specifically designed to accommodate the ATS-5 spin is described. The test program will employ the 1540-to 1660-MHz frequency band and will involve an FAA

KC-135 jet airplane, the spinning NASA ATS-5 satellite, and a ground station at the FAA NAFEC facility. Four experimental L-band antennas are designed for installation on the KC-135: a steerable quad helix, a crossed-dipole multipath array, and two low-gain slot dipoles. The ground station and airborne terminal hardware are defined. Detailed measured performance data are given for the antennas and major equipment subsystems. The field test program and analysis of the data acquired are accomplished under phases 4 and 5 of the contract. Author

N75-14932# Boeing Commercial Airplane Co., Seattle, Wash.
ATS-5 MULTIPATH/RANGING/DIGITAL DATA L-BAND EXPERIMENTAL PROGRAM. PHASE 4: FLIGHT TEST PROCEDURES AND FLIGHT TEST SUMMARY Final Report, 1 Mar. 1971 - 1 Jun. 1972
Apr. 1973 77 p refs
(Contract DOT-FA69WA-2109)
(AD-783585; D6-60180; FAA-RD-73-57-4) Avail: NTIS HC $4.00 CSCL 17G

The flight test phase of the multipath/ranging/digital data L-band experimental program is described. Special instrumentation, installation design, and initial terminal checkout procedures are discussed. Flight testing began in April 1971 using the satellite L-L NBFT mode but was reconfigured for the CXL mode following failure of the satellite L-band receiver. The link configuration changes and hardware modifications required are described. The remaining 27 flights were conducted between August 1971 and May 1972 using the modified link and the CXL satellite mode. The flight test organization, flight test geometries, detailed test plans, NASA support requirements, and typical operations scehdules for the various tests are given. A summary tabulation of the data flights and a discussion of the in-flight system calibration procedures is included. Author

N75-14933# Boeing Commercial Airplane Co., Seattle, Wash.
ATS-5 MULTIPATH/RANGING/DIGITAL DATA L-BAND EXPERIMENTAL PROGRAM. PHASE 4D: ADDITIONAL TESTS. VOLUME 1: SATELLITE/AIRCRAFT L-BAND DATA COMMUNICATION TESTS Final Report
Apr. 1973 130 p refs
(Contract DOT-FA69WA-2109)
(AD-783586; D6-60186-1-Vol-1; FAA-RD-73-57-4D-Vol-1)
Avail: NTIS HC $4.75 CSCL 17G

A digital data transmission experiment conducted between the NASA/Rosman ground station and an FAA KC-135 jet airplane a L-band via the geostationary NASA ATS-5 satellite is described. Sixteen tests were conducted during March and April 1973. All tests employed PSK transmission of alphanumeric text and pseudonoise sequences over the link to obtain a quantitative comparative evaluation of CPSK, DECPSK, and DPSK detection techniques. Significant results included performance characterization of the detection techniques for both the AWGN channel and the Rician fading channel in the presence of overocean multipath. Reception of message using slot dipole antennas on the aircraft was also successfully demonstrated. Results are presented and discussed relative to theoretical expectation.
Author

N75-14934# Boeing Commercial Airplane Co., Seattle, Wash.
ATS-5 MULTIPATH/RANGING/DIGITAL DATA L-BAND EXPERIMENTAL PROGRAM. PHASE 4D: ADDITIONAL TESTS. VOLUME 2: OVERLAND MULTIPATH, PACIFIC MULTIPATH, SCINTILLATION TESTS Final Report
Apr. 1973 101 p refs
(Contract DOT-FA69WA-2109)
(AD-783652; D6-60186-2-Vol-2; FAA-RD-73-57-4D-Vol-2)
Avail: NTIS HC $3.75 CSCL 17G

Experimental results at L-band are presented for eight overland multipath flights, six overocean multipath flights in the Pacific region, and a series of fixed-link scintillation measurements within the 1545- to 1655-MHz frequency band allocated for future aeronautical satellite services. Test signals were transmitted from the NASA/Rosman ground station to an FAA KC-135 jet airplane via the NASA ATS-5 satellite. Overland multipath data were acquired at elevation angles between 14 deg and 19 deg over marshy, hilly, and mountainous terrain in northern Canada and Alaska for both summer and winter conditions. These data together with the Pacific region overocean multipath data were analyzed to determine scatter reflection coefficients, circular polarization sense reversal characteristics, and power spectral density. Scintillation test data were analyzed to determine signal time histories, amplitude histograms, S2 scintillation parameter, statistical fade depths, and power spectra. Author

N75-14935# Boeing Commercial Airplane Co., Seattle, Wash.
ATS-5 MULTIPATH/RANGING/DIGITAL DATA L-BAND EXPERIMENTAL PROGRAM. PHASE 5: MULTIPATH/RANGING ANALYSIS AND RESULTS Final Report, 1 Jun. - 30 Sep. 1972
Apr. 1973 242 p refs
(Contract DOT-FA69WA-2109)
(AD-783588; D6-60181; FAA-RD-73-57-5) Avail: NTIS HC $6.00 CSCL 17B

Experimental results are presented for 30 multipath and ranging test flights involving an FAA KC-135 jet airplane, the NASA ATS-5 satellite, the NASA/Rosman ground station, and the FAA NAFEC facility. Tests included overocean multipath measurements and one-way tone ranging between the ground station and airplane via the satellite. Data were acquired over the North Atlantic at satellite elevation angles between 9 deg and 31 deg, within the 1545 to 1655 MHz frequency band allocated for future aeronautical satellite services. Significant multipath experiment results include determination of the multipath signal amplitude statistics, power spectral density, polarization properties, and selective fading characteristics. Multipath results are correlated with theoretical predictions based on use of the physical optics scatter model. Ranging experiment results include performance confirmation of a narrow-band CW tone ranging technique, characterization of the effect of multipath on ranging accuracy, and concept demonstration using low-gain slot dipole aircraft antennas. Comparison of experimental ranging results with theoretical predictions is given. Author

N75-14936# National Aviation Facilities Experimental Center, Atlantic City, N.J.
NETWORK TERMINAL EQUIPMENT, EXPERIMENTATION WITH ELECTRONIC SELECTION EQUIPMENT: DIGITAL SEQUENCE DETECTOR Final Report, Nov. 1971 - Apr. 1973
Charles G. Santora Jun. 1974 75 p
(FAA Proj. 064-222-000)
(AD-781531; FAA-NA-73-97; FAA-RD-74-102) Avail: NTIS HC $4.00

The implementation of a digital sequence detector is evaluated as a replacement for the teletypewriter mechanical stunt box. The device is intended to obtain more capacity for addresses and answerback, greater reliability, and easier, faster reprogramming and repair. It was found to perform equally or better than the model 28 automatic send/receive teletypewriter stunt box it replaced. It also performed satisfactorily for eight-level and for the polarity-reversing voltage, high-impedance operations.
Author

N75-14937*# Airborne Instruments Lab., Melville, N.Y. Electro-Optics Dept.
WIDEBAND INFRARED HETERODYNE RECEIVER FRONT-END Final Report
B. J. Peyton and J. Wolczok Aug. 1974 55 p refs
(Contract NAS5-23119)
(NASA-CR-139172; AIL-7886-1) Avail: NTIS HC $4.25 CSCL 17B

A 10.6 micron infrared heterodyne receiver front end was developed for use in a wideband CO2 laser communications link. The infrared receiver employs an 850 MHz response PV HgCdTe photomixer which is mounted in a space quality housing, a low-noise 5 to 1500 MHz IF preamplifier, and a remote control panel. The receiver was designed to handle + or - 750 MHz of Doppler shift while providing an instantaneous information bandwidth of 400 MHz. The measured receiver sensitivity NEP was 1.0 x 10 to the 19th power W/Hz for a photomixer temperature of T sub m = 77 K and an IF beat frequency of 20 MHz and degraded to 1.75 x 10 to the 19th power W/Hz for T sub m = 130 K. Author

N75-14938*# Airborne Instruments Lab., Deer Park, N.Y.
WIDEBAND INFRARED RECEIVER BACKEND Final Report

T. Flattau and J. Mellars Aug. 1974 78 p refs
(Contract NAS5-23183)
(NASA-CR-139165; A191-1) Avail: NTIS HC $4.75 CSCL 17B

The design, operation, and configuration of the receiver backend for a wideband infrared tracking receiver are described. A squaring loop is incorporated into the receiver design to enable it to track the Doppler shifted carrier which is Phase Shift Keyed modulated. The receiver has a 400 MHz instantaneous bandwidth and tracks signals whose carrier frequency at the backend input is between 200 and 900 MHz with frequency variation rates greater than 20 MHz/second. The output data is compatible with MECL 3 logic. Author

N75-14939*# Georgia Inst. of Tech., Atlanta. Communications Div.
TYPICAL TELEOPERATOR TIME DELAY PROFILES, PHASE 2 Final Report, 6 Oct. - 6 Dec. 1974
R. D. Wetherington and J. R. Walsh 6 Dec. 1974 93 p refs
(Contract NAS8-30919)
(NASA-CR-120591) Avail: NTIS HC $4.75 CSCL 17B

The results of the second phase of a study on time delays in communications systems applicable to the teleoperator program are presented. Estimates of the maximum time delays that will be encountered and presents time delay profiles are given for (1) ground control to teleoperator in low earth orbit, (2) ground control to teleoperator in geosynchronous orbit, and (3) low earth orbit control to teleoperator in low earth orbit. Author

N75-14940*# Hansen (R.C.), Inc., Encino, Calif.
DESIGN TRADEOFF STUDY FOR REFLECTOR ANTENNA SYSTEMS FOR THE SHUTTLE IMAGING MICROWAVE SYSTEM Final Report
R. C. Hansen 30 Aug. 1974 61 p refs
(Contract JPL-954026; Contract NAS7-100)
(NASA-CR-140915; FR-636-1) Avail: NTIS HC $4.25 CSCL 20N

A general tradeoff is made of the symmetric Cassegrain antenna with regard to the possibility of meeting a 90% beam efficiency. The effects of aperture taper and blockage are calculated using an adjustable sidelobe circular distribution. Numerical integration is used. For the feed spillover calculation, a low sidelobe symmetric feed pattern is used with the equivalent parabola and numerical integration. Reflector cross polarization is calculated using double numerical integration. Reflector back lobes are estimated from radiation pattern envelopes of commercial common carrier dish antennas. The curves allow a range of f/D to be determined for a specified edge taper and blockage diameter ratio, and with a table of Cassegrain parameters, a range of possible designs that meet the 90% beam efficiency is obtained. It is shown that the feed and reflector design and implementation must be carefully done. Author

N75-14941# Sandia Labs., Albuquerque, N.Mex.
EXPANSION METHOD FOR CALCULATING DISPERSION OF ELECTROMAGNETIC PULSES PROPAGATING IN THE IONOSPHERE
C. N. Vittitoe Jun. 1974 50 p refs
(Contract AT(29-1)-789)
(SLA-74-191) Avail: NTIS HC $3.75 CSCL 20N

An expansion method for calculating the effect of dispersion upon electromagnetic pulses propagating through the ionosphere is applied to a double exponential pulse. The phase angle introduced by the transmission medium is expanded in a Taylor series, which is truncated after the second order dispersion term. It is found that the high frequency, low dispersion components often add constructively to produce the maximum amplitide in the transmitted signal. Equations are presented for frequency domain analysis of the signal, but results are given in the time domain. Appendixes outline a rapid method for calculation of the Fresnel integral and its auxiliary functions; present results for propagation of the double exponential pulse through a series of atmospheric ionizations; and illustrate the contributions of individual frequency components. Author (NSA)

N75-14942# Syracuse Univ. Research Corp., N.Y.
ON-LINE HIGH RESOLUTION ELECTROMAGNETIC IMAGING Final Report, 17 Jan. 1973 - 17 Jan. 1974
Robert A. Herman, Peter. H. Stockman, and Joseph W. Verzino Aug. 1974 120 p refs
(Contract F30602-73-C-0136)
(AD-786033; SURC-TR-74-065; RADC-TR-74-201) Avail: NTIS CSCL 17/9

The objective of the study was to determine if techniques could be intergrated to form an on-line, real-time system for imaging objects. An additional objective of the investigation was to determine the hardware and software required to implement such a system to assess its overall effectiveness. A hardware/software system was devised that demonstrated the feasibility of producing images in near real-time from wideband radar data. The appropriate algorithms were developed to demonstrate the technique, and subsystem interactions are documented in flow diagrams. In addition, reduced cost/capacity systems were investigated; each of these systems is capable of producing real-time images. (Modified author abstract) GRA

N75-14943# Collins Radio Co., Dallas, Tex.
PACKET RADIO COMMUNICATIONS Quarterly Report
F. H. Dickson 30 Sep. 1974 83 p refs
(Contract DAHC15-73-C-0192; ARPA Order 2305)
(AD-786155; Rept-523-0699813-001C3L) Avail: NTIS CSCL 17/2

Three major areas of activities in support of packet radio communications are reported in this document. These are: (1) analysis of the pseudorandom code spread spectrum technique, (2) evaluation and selection of the pseudorandom codes for the experimental repeater, and (3) development of a signal capture model. The analysis of the code spread spectrum includes considerations of synchronization and multiple access capabilities. The code selection is based on the computer-derived side lobe properties and crosscorrelation of high data rate codes with low data rate codes. The developed capture model is based on the repeater design currently being developed and will be used to model capture in the existing packet radio network simulation models, which presently have no capture. Also, a brief status report of the repeater equipment development is included in the introduction. Author (GRA)

N75-14944# Army Foreign Science and Technology Center, Charlottesville, Va.
EXPERIENCE GAINED IN TRANSMITTING A CARTOGRAPHIC IMAGE BY PHOTOTELEGRAPH
I. I. Maksimov and N. P. Maksimov 24 Apr. 1974 8 p Transl. into ENGLISH from Geod. Kartografiya (USSR), no. 2, Feb. 1973 p 58-61
(AD-786037; FSTC-HT-23-0156-74) Avail: NTIS CSCL 17/2

The report is an article dealing with the transmission of a cartographic image by phototelegraph. The quality of image transmitted in this way is entirely satisfactory, and can be used in cartographic production and analysis of cartographic material. Some method for compressing the information must be found to reduce time and costs. GRA

N75-14945# Army Foreign Science and Technology Center, Charlottesville, Va.
EFFICIENCY OF RADAR DETECTION OF CLOUDS AND PRECIPITATION
V. D. Stepanenko 9 Apr. 1974 14 p Transl. into ENGLISH from Radiolokatsiya v Meteorologii (Leningrad), 1973 p 123-131
(AD-786802; FSTC-HT-23-325-74) Avail: NTIS CSCL 04/2

The capabilities of radar detection of clouds and precipitation are characterized by maximum ranges and the probability of detecting these phenomena. The first characteristic is determined by radar technical parameters, cloud and precipitation reflectivity, and the second -- by the incidence of these atmospheric formations in a particular geographical region. GRA

N75-14946# North Carolina Univ., Chapel Hill. Dept. of Statistics.
ON THE FORM OF THE LIKELIHOOD RATIO FOR TWO DIMENSIONAL RANDOM FIELDS Interim Report
Stamatis Cambanis 1974 9 p ref
(Grant AF-AFOSR-2386-72; AF Proj. 9769)
(AD-785422; AFOSR-74-1409TR) Avail: NTIS CSCL 09/4

It is shown that the likelihood ratio detector of a random signal in white Gaussian noise, when both the signal and the noise are two-dimensional random fields, cannot be realized by an estimator matched-filter combination unless the signal is deterministic. This was conjectured in a recent paper where a recursive formula was derived for the likelihood ratio. Author (GRA)

N75-14947# Naval Ordnance Lab., White Oak, Md.
DESIGN OF A FREQUENCY-LOCK LOOP FOR PADD 2 (NSAP PROJECT EC-172) Final Report
Arthur D. Delagrange 25 Jun. 1974 18 p refs
(ZF43410001)
(AD-785852; NOLTR-74-122) Avail: NTIS CSCL 17/1

The report describes the design of a frequency-lock loop for the PADD II harbor patrol sonar. It will be of interest to those familiar with PADD II. It may also be of interest to persons working with automatic frequency acquisition, frequency tracking, or phase-lock loops. GRA

N75-14948# Naval Underwater Systems Center, New London, Conn.
OPERATING CHARACTERISTICS FOR MAXIMUM LIKELIHOOD DETECTION OF SIGNALS IN GAUSSIAN NOISE OF UNKNOWN LEVEL. 3: RANDOM SIGNALS OF UNKNOWN LEVEL
Albert H. Nuttall and Peter G. Cable 31 Jul. 1974 64 p refs
(ZF1112001)
(AD-786729; NUSC-TR-4783) Avail: NTIS CSCL 09/4

The detection and false alarm probabilities for maximum likelihood detection of two classes of random signals in stationary Gaussian noise, where the signal and noise levels are unknown, are derived. The two classes are Gaussian signals and deterministic signals of unknown phase with slow fading on each of M potential-signal branches. For the Gaussian signals and the deterministic signals with independent Rayleigh envelope fading on each of the M branches, the performances are identical, and extensive numerical results are presented. For more general signal fading, the detection probability is presented as a finite sum of hypergeometric functions that can be easily evaluated with computer aid; however, no numerical results are given for this more general situation. Author (GRA)

N75-14949# California Univ., Berkeley. Electronics Research Lab.
RESEARCH IN INTEGRATED, HIGH FREQUENCY COMMUNICATION CIRCUITS Final Report, 31 Jan. 1967 - 31 Dec. 1973
Robert G. Meyer, Donald O. Pederson, and Graham A. Rigby Aug. 1974 13 p refs
(Contract DAHC04-67-C-0031; Grants
DA-ARO(D)-31-124-72-G50; DA-ARO(D)-31-124-72-G52;
DA-ARO(D)-31-124-72-G54)
(AD-786725; AROD-6611-28-E) Avail: NTIS CSCL 09/5

The report is a summary of research in High-frequency Communication integrated circuits. Many types of circuit functions have been investigated with the end goal of optimized design. Circuits include balanced quads with minimum temperature drift, AGC amplifiers with maximum dynamic range, high frequency monolithic oscillators and temperature in sensitive, monolithic, frequency selective amplifiers. A significant component of these research topics has been the use and development of sophisticated circuit simulators. (Modified author abstract) GRA

N75-14950# General Electric Co., Syracuse, N.Y. Transducer Products Operation.
DUMILOAD TRANSDUCER TESTER Final Report
Wayne A. Miller Sep. 1974 36 p
(Contract N00024-73-C-1063; SF11121304)
(AD-786769) Avail: NTIS CSCL 17/1

A DUMILOAD (DUmmy Mechanical Impedance LOAD) transducer testing device has been developed to allow the rapid testing of sonar transducer elements. The final report provides the theory, design philosophy, and test results of the DUMILOAD. Significant features of the device are its high power operation, nondestructive connect/disconnect technique, and rapid operation. Author (GRA)

N75-14951# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
AN ANALYSIS OF TWO PROBLEMS RELATED TO OVER-THE-HORIZON DETECTION IN THE HF BAND
Edwin Shotland Jul. 1974 25 p refs
(Contract N00017-72-C-4401)
(AD-786977; APL-TG-1253) Avail: NTIS CSCL 17/9

A 21 -db discrepancy between theory and experiment concerning Bragg scattering of HF ground waves by a rough sea is analyzed and resolved. In addition, a new and more efficient method of non-dimensionalization is proposed for the quantities of radio propagation in the HF band that could be adopted by all electromagnetic and acoustical wave bands of propagation. It is especially useful in the application of the Norton-Barrick concept of basic transmission loss. Author (GRA)

N75-14952# Stanford Research Inst., Menlo Park, Calif.
SPEECH DIGITIZATION BY LPC ESTIMATION TECHNIQUES Annual Technical Report, 3 Oct. 1972 - 31 Mar. 1974
D. T. Magill and C. K. Un Jul. 1974 142 p refs
(Contract DAHC04-72-C-0009)
(AD-785738) Avail: NTIS CSCL 17/2

This study is aimed at the broad goal of the DoD Secure Voice Consortium to develop hardware models of improved narrow-band voice coders. The study is focused on the pitch and voicing problem. The objective is to conceive and demonstrate the feasibility of two or more improved strategies to estimate and encode the excitation parameters of human speech. The decoded parameters will be used to excite a time-varying vocal tract filter in the synthesizer. GRA

N75-14953# Philco-Ford Corp., Palo Alto, Calif. Western Development Labs. Div.
INTERMODULATION STUDY. INTERMODULATION PRODUCTS: SATELLITE GROUND ANTENNAS Final Test Report, 1 Apr. 1972 - 1 Apr. 1973
J. V. Rootsey, A. A. Gradisar, and J. R. P. Bordenave 24 Aug. 1973 170 p
(Contract DAAB07-72-C-0207)
(AD-785711; WDL-TR-5243) Avail: NTIS CSCL 09/5

A description of tests, observations, problems and results of work performed to reduce the intermodulation products generated in the 5-horn feed of a 60-foot diameter parabolic antenna. The goal was to produce feed components that generated intermodulation products at levels below -140 dBm while subjected to 10 kW CW of total power in any combination of carriers. The receive band was 7.25 to 7.75 GHz; the transmit band was 7.9 to 8.4 GHZ. The study was conducted in three phases: The determination of intermodulation levels as a function of total power, proportional power between carrier, waveguide current densities, vacuum, and test configuration; Specific problems encountered in fabricating waveguide devices, specifically flanges, seams, materials, tuning methods, and the degeneration of these factors with time; An effort to obtain specific intermodulation-free components, particularly stable filters and flanges. Author (GRA)

N75-14954# Federal Communications Commission, Washington, D.C. Research Div.
LONG TERM SKYWAVE FIELD STRENGTH MEASUREMENTS IN THE 550-1600 kHz FREQUENCY BAND
Jack Damelin 10 May 1974 39 p
(PB-234669/0; R-7103) Avail: NTIS HC $3.75 CSCL 17B

The report presents a compilation of ionospheric field strength data in the 550-1600 kHz frequency band accumulated by the Commission in the course of skywave recording at its field monitoring stations. These data were recorded over some 26 different transmission paths within the continental United States, usually over a period of an eleven year sunspot cycle. The actual recording paths are shown on a map. Author (GRA)

N75-14955*# Coast Guard Research and Development Center, Groton, Conn.
A CENSUS OF NEW YORK HARBOR MARINE TRAFFIC DERIVED FROM SIDE-LOOKING AIRBORNE RADAR DATA Final Report
J. A. McIntosh and L. D. Farmer Jul. 1974 50 p refs
(AD-786649; CGR/DC-19/74; USCG-D-13-75) Avail: NTIS CSCL 13/10

The purpose of the report is to document the findings of a census of New York Harbor marine traffic made during the period 15-21 November 1973. The purpose of the census was to obtain data for use by the Coast Guard on planning for a Vessel Traffic System for New York Harbor. A side-looking airborne radar SLAR was used to make the census so that data could be readily obtained at night or during poor visibility conditions. The report contains a discussion of the means by which the SLAR data was analyzed, as well as the census data itself.
GRA

N75-14956# Transportation Systems Center, Cambridge, Mass.
MULTIPATH CHANNEL SIMULATION AND MODEM EVALUATION PROGRAM Interim Report, Oct. 1973 - Apr. 1974
Christopher B. Duncombe Aug. 1974 77 p
(AD-787453; DOT-TSC-FAA-74-8; FAA-RD-74-151) Avail: NTIS CSCL 17B

The Department of Transportation, Transportation Systems Center has developed a laboratory communications test facility. To evaluate in a laboratory controlled simulated environment, alternative modulation techniques having potential application in aeronautical and maritime satellite communications and surveillance systems. The main feature of the communication test facility is the hardware for simulating, by means of laboratory equipment, the narrowband (50 KHz) AEROSAT satellite-to-aircraft propagation channel. The simulator also simulates the maritime satellite-to-ship propagation channel and is expandable to wideband (10 MHz) systems; e.g., future CONUS ATC Systems. The simulator includes provisions for duplicating multipath phenomena over the satellite links and includes provisions for adjustment and programming of channel parameters covering a wide range of environmental conditions. (Modified author abstract) GRA

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N75-14957* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FOUR PHASE LOGIC SYSTEMS Patent
Howard L. Petersen (Lockheed Missiles and Space Co., Sunnyvale, Calif.) and Donald K. Kinell, inventors (to NASA) (Lockheed Missiles and Space Co., Sunnyvale, Calif.) Issued 24 Dec. 1974 7 p Filed 17 Apr. 1973 Supersedes N73-21240 (11 - 12, p 1386) Sponsored by NASA
(NASA-Case-MSC-14240-1; US-Patent-3,857,045; US-Patent-Appl-SN-351929; US-Patent-Class-307-208; US-Patent-Class-307-205) Avail: US Patent Office CSCL 09C

A four-phase logic system is provided which includes at least four logic networks connected in parallel between a single power line and a reference potential. A four-phase clock generator generates four distinct clock signals from a single-phase clock input at data rate. Each logic network comprises a pair of complementary metal-oxide-semiconductor integrated transistors (CMOST). Each metal-oxide-Semiconductor transistor (MOST) in the pair is responsive to a clock signal which turns the transistor on or off. In each network, there is also at least one MOST which is responsive to a logic signal. The logic transistor is connected in cascade with the pair of CMOSTs.
Official Gazette of the U.S. Patent Office

N75-14958 Polish Academy of Sciences, Warsaw.
METHOD OF EVALUATING THE MECHANICAL PROPERTIES OF ELECTRIC MOTORS [METODA OCENY WLASNOSCI MECHANICZNYCH SILNIKOW ELEKTRYCZNYCH]
W. Kurowski and B. Ryśinski 1973 16 p In POLISH
(Rept-28/1973) Avail: Issuing Activity

Direct current and asynchronous electric motors were investigated to determine which electrical and mechanical properties or defects can cause frequency oscillations and vibrations. Support bearings, ventilators, electromagnetic fields, stator poles, and rotor cages are also discussed.
Transl. by M.J.S.

N75-14959 Radiotechnique-Compelec, Paris (France). Div. COGECO.
INVESTIGATION ON NEW DIELECTRICS FOR HIGH PERFORMANCE MINIATURE CAPACITORS Final Report [RECHERCHE ET ETUDE DE NOUVEAUX DIELECTRIQUES POUR CONDENSATEURS MINIATURISES DE HAUTES PERFORMANCES]
M. Perigord Dec. 1973 12 p refs In FRENCH Prepared jointly with Bordeaux Univ.
(Contract DGRST-72-7-0525)
Avail: Issuing joactivity

Dielectric characteristics of fluorides and oxyfluorides of several metals were studied in pellet and thin layer form for use in miniature static capacitors. Thin layers were obtained by classical thermal vaporizing, flash vaporization, and cathodic radio frequency pulverization. Among the oxyfluorides exhibiting high dielectric permeability as thin layers two compounds are cited Pb1.9Na0.1Nb2O6.9F0.1 and Pb1.75Zn0.2Na0.05Nb2O6.95F0.02.
ESRO

N75-14960*# Avco Corp., Wilmington, Mass. Systems Div.
FEASIBILITY STUDY OF A STEP SCANNED OMNIDIRECTIONAL COMMUNICATIONS ANTENNA FOR AN INTERNATIONAL MAGNETOSPHERIC EXPLORER SPACECRAFT Final Report, 1 Apr. - 22 Jul. 1974
Richard E. Herskind 28 Oct. 1974 135 p refs
(Contract NAS5-20020)
(NASA-CR-139161; AVSD-0298-74-RR) Avail: NTIS HC $5.75 CSCL 09E

The results of this study has indicated that omnidirectional antennas requiring directive gains steered off broadside are limited by the feed system efficiencies. The directive gain can be increased to offset the feed losses, but this approach leads quickly to diminishing returns. While gains of 4.8 db appear feasible, a system gain of 3.0 db is considered practical. These results apply to antenna configurations limited in packaging volume to 10 cm diameter by 61 cm length.
Author

N75-14961*# Airborne Instruments Lab., Deer Park, N.Y.
DEVELOPMENT AND FABRICATION OF S-BAND CHIP VARACTOR PARAMETRIC AMPLIFIER Final Report, Aug. 1973 - Nov. 1974
Erich Kramer Nov. 1974 182 p refs
(Contract NAS5-20460)
(NASA-CR-139171) Avail: NTIS HC $7.00 CSCL 09A

A noncryogenic, S-band parametric amplifier operating in the 2.2 to 2.3 GHz band and having an average input noise temperature of less than 30 K was built and tested. The parametric amplifier module occupies a volume of less than 1-1/4 cubic feet and weighs less than 60 pounds. The module is designed for use in various NASA ground stations to replace larger, more complex cryogenic units which require considerably more maintenance because of the cryogenic refrigeration system employed. The amplifier can be located up to 15 feet from the power supply unit. Optimum performance was achieved through the use of high-quality unpackaged (chip) varactors in the amplifier design.
Author

N75-14962# Philco-Ford Corp., Willow Grove, Pa. Communication Systems Div.
FAA PRINTED CIRCUIT BOARD ANALYSIS: CATEGORIZATION AND DATA COLLECTION Final Report
Gerald L. Ginsberg Dec. 1973 118 p
(Contract DOT-FA72WA-3000)
(AD-782045; FAA-RD-74-108) Avail: NTIS HC $4.50

A system is established for categorizing printed circuit boards. Levels of each category or group are defined, and degrees are set within each category as needed. The categorization system was devised after evaluation of data collected on FAA printed circuit boards, with consideration given to various government and industry documents.
Author

N75-14963*# Martin Marietta Corp., Orlando, Fla. Structural Analysis and Materials Labs.
DESIGN, DEVELOPMENT, FABRICATION AND TESTING OF HIGH TEMPERATURE FLAT CONDUCTOR CABLE (FCC) Final Report, Jun. 1972 - Jul. 1974
Walter S. Rigling 31 Jul. 1974 46 p
(Contract NAS8-29076)
(NASA-CR-120576; OR-13246) Avail: NTIS HC $3.75 CSCL 09A

The results are presented of a development program for a flat, 25-conductor signal cable and a flat, 3-conductor power cable. Flat cables employ conductors made of strips or flattened round copper conductors insulated with polyimide films. It is shown that conductor thickness ranges from 0.003 to 0.010 inch, and begins to soften and loose mechanical strength at temperatures above 200 C. M.C.F.

N75-14964*# National Aeronautics and Space Administration. Pasadena Office, Calif.
HIGHLY EFFICIENT ANTENNA SYSTEM USING A CORRUGATED HORN AND SCANNING HYPERBOLOID REFLECTOR Patent Application
Kenneth A. Green, inventor (to NASA) (Microwave Res. Corp.) Filed 19 Dec. 1974 16 p Sponsored by NASA Prepared for JPL
(Contracts NAS7-100; JPL-953409)
(NASA-Case-NPO-13568-1; US-Patent-Appl-SN-534265) Avail: NTIS HC $3.25 CSCL 09E

The characteristics of a horn-reflector antenna system for producing a beam of high efficiency with a spherical aperture phase front and side lobes. A diagram of the antenna is provided to show the antenna construction. The system is insensitive to frequency and polarization changes, and is also insensitive to orientation about the axis of the conical horn for beam scanning. The improved antenna radiation pattern is applicable to communication systems and radar systems requiring low noise.
NASA

N75-14965*# Ball Bros. Research Corp., Boulder, Colo.
REDSHIFT ANTENNA PROJECT Final Technical Report
20 Nov. 1974 44 p
(Contract NAS8-29504)
(NASA-CR-120581) Avail: NTIS HC $3.75 CSCL 09E

The layout of a center frequency 2203.1 MHz antenna is presented. The four to one taped layout was photograph reduced and a single section was etched. Initial impedance and frequency mismatches were corrected, and impedance plots of each of the two sections are shown. With the 2203.1 MHz layout as a reference, initial layouts were made for the remaining two frequencies 2117.7 and 2299.7 MHz, and single sections were fabricated. M.C.F.

N75-14966# Gulf General Atomic, San Diego, Calif.
MANUFACTURING PLAN ERTG RING CONVERTER Final Status Report
1 May 1974 85 p refs
(Contract AT(04-3)-943)
(GA-A-12914) Avail: NTIS HC $4.75

This Manufacturing Plan covers the control of all purchases of materials and the manufacture of all components and assemblies for the RING converter for the economical radioisotope thermoelectric generator (ERTG). The plan covers the time span from the approval of engineering drawings through the manufacture of hardware. All manufactured parts and assemblies, from the release of engineering drawings through the manufacture of the RING converter, will be controlled by manufacturing control documents and by quality assurance. This plan is a revision of the TRANSIT plan (GACD-9684) and has been modified to fit the RING converter. A considerable number of tasks and requirements of TRANSIT are directly applicable to the fabrication of the RING converter. Those items in the TRANSIT plan not applicable to the RING were removed, while other new or unique items were added. Appendix A lists the equipment needed for the RING converter fabrication. Appendix B presents the development status of materials, processes and testing.
Author (NSA)

N75-14967# Gulf General Atomic, San Diego, Calif.
PRELIMINARY EVALUATION OF THE RING CONVERTER SECTION DEMONSTRATION TEST
G. B. Bradshaw 9 Mar. 1974 34 p refs
(Contract AT(04-3)-943)
(GA-A-12922) Avail: NTIS HC $3.75

A preliminary analysis and summary of performance data measured on the General Atomic Ring Converter Section are reported. The Ring converter is an advanced concept for a very lightweight, low-cost thermoelectric converter that applies the technology developed for the TRANSIT RTG. The objective of the performance test on the Ring converter was to demonstrate the electric power output of this first manufacturing prototype model. A photograph of the test unit is shown. NSA

N75-14968# Westinghouse Electric Corp., Pittsburgh, Pa. Research and Development Center.
THIN FILM TRANSISTOR-ADDRESSED DISPLAY DEVICE Quarterly Report, 22 Feb. - 22 May 1973
Thomas P. Brody, Willie Lehmann, Zoltan P. Szepesi, G. F. Saletta, and David H. Davies Aug. 1974 45 p
(Contract DAAB07-72-C-0061; DA Proj. 1X6-63707-D-245)
(AD-785715; ECOM-72-0061-5; Rept-74-9F2-DSPLA-R2; QR-5) Avail: NTIS CSCL 09/5

Design of the final thin film version (signal and power transistor) of the flat panel display control circuit was completed and further progress in fabrication made. Device uniformity tests on the 6 in. x 6 in. panel were conducted and the results exceeded expectations. Considerable progress was made in understanding the principles of the hypermaintenance electroluminescent (EL) phosphor and how the phosphor fabrication process influences life. Excellent maintenance of EL phosphor brightness was achieved with 1,000 - 10,000 hours of 5000 c.p.s. operation, at 150 V, already demonstrated on material of 50 fL initial brightness. The display exerciser construction was completed, it was tested and performed to specifications. Author (GRA)

N75-14969# Westinghouse Electric Corp., Pittsburgh, Pa. Research and Development Center.
ELECTROLUMINESCENT FILM DISPLAY DEVICE
Thomas P. Brody, William S. Escott, Willie Lehmann, and David H. Davies Aug. 1974 35 p refs
(Contract DAAB07-72-C-0061; DA Proj. 1X6-63707-D-245)
(AD-785714; Rept-74-9F2-DSPLA-R1; ECOM-72-0061-4; QR-4) Avail: NTIS CSCL 09/5

During the reporting period, progress in fabricating 6 in. x 6 in. thin film transistor (TFT) display circuits was slowed due to equipment failure. These problems were largely overcome. A technique was devised, and demonstrated, for making good edge connections to the array using evaporated metal fingers. Considerable efforts was devoted to constructing an alternative vacuum deposition system, with alignment jigs, etc., in order to increase the rate of circuit panel fabrication. Initial design and fabrication of a display exerciser was begun. A 5 x 7 matrix format for alphanumeric read-out was chosen, the exerciser will refresh the display on a row by row basis every 1.2 mS. Further studies on uniformity and stability continued with encouraging results. Author (GRA)

N75-14970# Westinghouse Electric Corp., Pittsburgh, Pa. Research and Development Center.
THEORY AND DESIGN OF ELECTRICAL ROTATING MACHINERY Annual Technical Report, 1 May 1973 - 30 Apr. 1974
W. J. Carr, Jr. Sep. 1974 15 p
(Contract N00014-72-C-0432; NR Proj. 097-385)
(AD-786240; ATR-2) Avail: NTIS CSCL 09/3

The objective of the program is to contribute toward new and improved rotating machines for Naval applications, with emphasis on superconducting machinery. An important factor in the design of superconducting machinery is the ac hysteresis and eddy current loss which occurs in the multifilament conductors generally used for ac operation. Reduction of this loss, to reduce the required refrigeration capacity, is necessary for wide-range use of superconducting machines. Theory has been developed and substantial progress has been made toward understanding the ac loss in multifilament conductors. The theory may be used for the design of optimum conductors. In the area of

actual machine research, a low speed, high torque heteropolar dc superconducting motor has been studied with encouraging results. In addition the maximum power rating of various types of dc machines has been estimated. Author (GRA)

N75-14971# Radio Corp. of America, Burlington, Mass. Government Communications and Automation Systems Div.
MANUFACTURING METHOD AND TECHNOLOGY PROGRAM FOR AUTOMATED IMAGE DEVICE EVALUATOR (AIDE) Quarterly Progress Report, 1 Apr. - 30 Jun. 1974
J. F. McCarthy Jul. 1974 94 p refs
(Contract DAAB05-74-C-2524)
(AD-785723; QPR-2) Avail: NTIS CSCL 09/1

The report presents the results of the Return Beam Vidicon (RBV) feasibility evaluation effort, the Applicability Analysis phase of the task and the initial equipment design accomplishments. Also included in the report is the recommended configuration of the demonstration model AIDE equipment. (Modified author abstract) GRA

N75-14972# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STRUCTURE, METHOD OF OPERATION AND APPLICATIONS OF ELECTRON BEAM TUBES WITH LONG STORAGE TIMES (STORAGE TUBES)
L. Todt 26 Jul. 1974 19 p Transl. into ENGLISH from Militaertechnik (East Germany), no. 3, 1974 p 106-110
(FTD Proj. T74-05-04A; FTD Proj. T74-05-07)
(AD-784847; FTD-HC-23-2497-74) Avail: NTIS CSCL 09/1

The methods for operating storage tubes are summarized. Fundamental working principles are discussed and illustrated. Brief descriptions are provided for the following types of tubes: (1) image scanning tubes; (2) blue lighting storage tubes; (3) charge storage tubes; and (4) image storage tubes. N.E.R.

N75-14973# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
HEAT TRANSFER IN PULSED SUPERCONDUCTING MAGNETS Final Report, 10 Apr. - 31 Dec. 1973
V. Arp, P. J. Giarratano, R. C. Hess, and M. C. Jones Aug. 1974 141 p refs Sponsored by AFAPL
(AF Proj. 3145)
(AD-786062; NBSIR-74-363; AFAPL-TR-74-62) Avail: NTIS CSCL 09/1

The first section of the report summarizes design problems for the development of advanced superconducting pulse magnets, leading to recommendations for future work, primarily in (1) evaluation of eddy-current, hysteresis, and frictional losses, and (2) transient heat transfer between the superconductor and the helium. Two subsequent sections report measurements of forced convection heat transfer respectively to subcooled liquid helium and to supercritical helium just above the critical pressure. Author (GRA)

N75-14974# Northrop Corp., Hawthorne, Calif. Research and Technology Center.
RADIATION HARDENING OF LINEAR MICROCIRCUITS BY TERMINAL PHOTOCOMPENSATION Final Report, 15 Apr. 1972 - 1 Aug. 1973
D. N. Pocock and M. G. Krebs Jun. 1974 116 p refs
(Contract F29601-72-C-0084; AF Proj. 5710)
(AD-786022; AFWL-TR-73-110) Avail: NTIS CSCL 09/5

The feasibility of using terminal photocompensation to reduce the ionizing-radiation vulnerability of linear microcircuit amplifiers is investigated. An analytical basis for terminal photocharge compensation is presented. Linear terminal models are developed for four types of integrated circuit amplifiers and are used to analyze the qualitative effects of terminal photocompensation. Experimental results show that two of the four microcircuits can be photocompensated with at least an order-of-magnitude reduction in the radiation-induced noise energy for several cases of external circuit configuration and radiation intensity. Author (GRA)

N75-14975# Fairchild Camera and Instrument Corp., Mountain View, Calif. Semiconductor Div.
STUDIES OF THE NUCLEAR RADIATION PERFORMANCE OF ISOPLANAR INTEGRATED CIRCUITS AND CIRCUIT COMPONENTS Final Report, 12 Jul. 1972 - 21 Jan. 1974
R. W. Marshall and D. K. Myers Jan. 1974 139 p refs
(Contract DAAG39-73-C-0002; HDL Proj. 212228; HDL Proj. 21428)
(AD-785705; HDL-TR-002-1) Avail: NTIS CSCL 09/5

The report describes the work accomplished in a program to measure and analyze the nuclear radiation performance of transistors, diodes, and integrated circuits fabricated with the standard Fairchild Isoplanar processes, the Fairchild dielectrically isolated Isoplanar process, and the Fairchild Isopoly or V-groove dielectric isolation process. These devices were characterized electrically and then exposed to ionizing dose, transient gamma, and fast neutron radiation environments to determine the effects of these environments on device performance. The possibility of new and/or different failure modes that could limit the use of these devices in the various radiation environments was investigated. (Modified author abstract) GRA

N75-14976# Arizona Univ., Tucson. Dept. of Chemistry.
POLYMERIC THERMISTORS, ELECTRICAL AND ELECTROCHEMICAL BEHAVIOR Technical Report, 1 Jan. - 31 Dec. 1974
Henry Freiser 4 Oct. 1974 16 p refs
(Contract N00014-67-A-0209-0017)
(AD-786893; TR-1) Avail: NTIS CSCL 09/1

The primary concern of the study was to identify the charge carriers and quantitatively evaluate the parameters involved in their generation and mobility. The effect of high pressure on the electrical conductivity is useful in distinguishing ionic from electronic semiconduction. GRA

N75-14977# Army Electronics Command, Fort Monmouth, N.J.
GAMMA RAY INDUCED CHARGE BUILDUP IN INSULATORS
Stanley Kronenberg, Ronald A. Lux, Kristian L. Nilson, Gayle K. Jurczyk, Robert L. Pfeffer, and Harry L. Berkowitz Sep. 1974 19 p refs
(DA Proj. 1T1-61101-A-094)
(AD-786665; ECOM-4252) Avail: NTIS CSCL 20/12

Irradiation of an insulator by gamma rays can produce voltage and charge buildups near thin layers of foreign material within the insulator. Measurements have been made of the current produced as a function of atomic nuber and thickness of the perturbing layer. Current was also measured as a function of separation from the perturbation, as was voltage buildup within the insulator close to the perturbation. Author (GRA)

N75-14978# Harry Diamond Labs., Washington, D.C.
RADIATION SUSCEPTIBILITY OF HIGH POWER GaAs INFRARED LIGHT EMITTING DIODES
Roland A. Polimadei, Stewart Share, Arnold S. Epstein, and Gene E. Gowins (Army Missile Command, Huntsville, Ala.) 1973 15 p refs
(AD-785661) Avail: NTIS CSCL 09/1

The paper reports the effects of gamma and neutron irradiation on the power output and efficiencies of a commercial, high-power GaAs LED of current interest to system designers. GRA

N75-14979# Army Foreign Science and Technology Center, Charlottesville, Va.
FORMATION OF SUBNANOSECOND FRONTS OF PULSES BY SWITCHES BASED ON CHALCOGENIDE GLASSES
V. N. Privalov, G. A. Shvets, and V. A. Shkut 16 Jan. 1974 5 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Radioelektron. (USSR), v. 15, no. 12, 1972 p 1515-1516
(AD-786839; FSTC-HT-23-1777-73) Avail: NTIS CSCL 09/1

Formation of nanosecond pulse fronts using sandwich type chalcogenide vitreous semiconductor diodes of compositions Te-Si, Te-As-Si, Te-As-Si-Ge, was investigated. A thyratron, giving a primary pulse length of 0.3 microsec with a front length of about 40 nsec, was used as the primary pulse generator. Oscillograms demonstrated an output pulse front length of not over 1-2 nsec. GRA

N75-14980# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE TECHNICAL AND ECONOMIC ASPECTS OF PREDICT-

ING THE DEVELOPMENT OF MICROELECTRONICS
I. Efimov, I. Kurnikov, A. Panfilov, and V. Savin 18 Sep. 1974 19 p Transl. into ENGLISH from the monograph "Teoriya i Praktika Prognozirovaniya Razvitiya Nauki i Tekhniki v Stranakh-Chlenakh Sev" USSR, 1971 p 282-292
(AD-786907; FTD-HC-23-2364-74) Avail: NTIS CSCL 09/5

The main factors which must be taken into account when predicting the volume and structure of the future need of the national economy for integrated circuits are: The technical and economic effectiveness of production and operation of apparatus based on IC; changes in gross production output of the consumer branches in consolidated nomenclatures; improvement of the technical parameters of the apparatus; improvement of the technical parameters of integrated circuits; expansion of their nomenclature and reduction of outlays for their production.
GRA

N75-14981# General Electric Co., Philadelphia, Pa. Space Div.
INFRARED VIDICON DEVELOPMENT Final Report, 8 Mar. 1973 - 25 Jan. 1974
James P. Spratt 14 Jun. 1974 35 p refs
(Contract F19628-73-C-0221)
(AD-786482; AFCRL-TR-74-0193) Avail: NTIS CSCL 09/1

The feasibility of using metal-silicon Schottky barrier diode arrays in the retina of an infrared vidicon is demonstrated. Improvements in retinae uniformity are demonstrated by a demountable camera tube with which a number of retinae of varying designs can be evaluated, keeping operating parameters such as electron optics and retina temperature constant. Such a demountable camera tube was built and tested, and is currently being used in on-going studies of infrared imaging using metal-silicon Schottky barrier infrared vidicon retinae. The tube can be operated in the high beam velocity mode, either positive or negative variation, or in the low beam velocity mode. (Modified author abstract)
GRA

N75-14982# Army Foreign Science and Technology Center, Charlottesville, Va.
CONTACTS OF THIN FILMS OF INDIUM-TELLURIUM AND GALLIUM-TELLURIUM SYSTEM COMPOUNDS WITH GROUP 1, 3, 5 METALS AND TELLURIUM
V. B. Tolutis and D. A. Sakalauskaite-Lasauskene 16 Jan. 1974 6 p Transl. into ENGLISH from the book "Ton. Plenk. i ikh Primen., yyp. 3 Trudy Simp. v. g." Vilna, 1969 p 184-186
(AD-786795; FSTC-HC-23-1728-73) Avail: NTIS CSCL 09/1

The current-voltage characteristics, photosensitivity, photoemf, and surface states of In3Te8, In3Te4, Ga3Te4, Ga3Te8, GaTe3 and CdIn2Te3 contacts with silver, gold, copper, indium, aluminum, bismuth, and tellurium were studied. The irreversible phenomena occurring in these contacts during their thermal and electrical formation at less than 0.00001 torr were examined. The experimental results obtained with In3Te4 are explained by the active interaction of electrode compounds. With the film and modification of the surface film state due to the particle drift of the cathode compounds.
GRA

N75-14983# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
PRECISION SINGLE SIDEBAND CRYSTAL UNITS Final Report, 1 May 1973 - 15 Jul. 1974
Raymond K. Hart Aug. 1974 60 p refs
(Contract DAAB07-73-C-0172-0004)
(AD-786559; GIT-A-1536-F; ECOM-0172-F) Avail: NTIS CSCL 09/1

The report is concerned with the systematic investigation of various cleaning and processing techniques which are used to assemble high precision single sideband (SSB) quartz resonators. The final requirement is to be able to produce crystal units which will meet a strict aging requirement of 2 x 10 to the minus 10th power/week, when measured at the upper turning point of the crystal unit after a stabilization period of 4 weeks. The specific aspects of resonator fabrication that was investigated during the study are several wet-cleaning processes for preparing quartz surfaces, the sputter-ion cleaning of quartz and the composition profiles and impurities associated with both the quartz surface and the copper electrodes. (Modified author abstract)
GRA

N75-14984# TRW Systems Group, Redondo Beach, Calif.
MODELLING, CHARACTERIZATION AND MEASUREMENT OF OSCILLATOR FREQUENCY INSTABILITY Final Report
William C. Lindsey (LinCom Corp.) and James L. Lewis 14 Jun. 1974 162 p refs Prepared jointly with LinCom Corp.
(Contract N00014-72-C-0107)
(AD-785862) Avail: NTIS CSCL 09/5

A mathematical characterization of oscillator amplitude, frequency and phase instability is given here in terms of the respective structure functions of amplitude, frequency and phase. Two classes of oscillator frequency processes are exploited, viz., those which are stationary and those possessing stationary increments. Numerous examples are given which can be used to characterize and model oscillator frequency spectra, hence frequency instability, observed in quartz crystal oscillators, injection-locked Gunn oscillators, rubidium and cesium frequency standards, multiplier chains and mixers used in the implementation of coherent communication receivers and transponders. Their affects on the phase error of a phase-locked loop are explored.
GRA

N75-14985# Varian Associates, Palo Alto, Calif. Microwave Tube Div.
DEVELOPMENT OF A PLANAR EQUIANGULAR SPIRAL AMPLIFIER Final Report, 1 Apr. 1973 - 31 May 1974
J. L. Putz and A. W. Scott Sep. 1974 55 p
(Contract DAAB07-73-C-0148)
(AD-787339) Avail: NTIS CSCL 09A

Work accomplished on the development of a radial-beam traveling wave tube is described. The RF circuit used consists of a pair of planar equiangular (logarithmic) bifilar spirals deposited on ceramic substrates and placed on either side of a thin flat electron beam which expands radially from a ring-shaped cathode. A detailed analysis of the circuit properties and the wave-beam interaction is presented. A rough design procedure is also given based on certain reasonable assumptions. A computer program has been developed to aid in optimizing designs. Experimental data from three tubes are presented, in the frequency range 0.5 to 1.0 GHz. (Modified author abstract)
GRA

N75-14986# Defense Documentation Center, Alexandria, Va.
RELIABILITY ELECTRONICS Report Bibliography, Jan. 1964 - Apr. 1974
Oct. 1974 524 p refs
(AD-787350; DDC-TAS-74-35) Avail: NTIS CSCL 09C

The bibliography contains unclassified and unlimited citations on Reliability Electronics. These references provide information emphasizing performance analysis, statistical analysis and mathematical prediction in studies and tests of reliability in electronic and electrical equipment. It also includes pertinent information on test equipment, failure analysis, cost effectiveness and military requirements. Four computer-generated indexes are included.
Author (GRA)

N75-14987# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
AN EXPERIMENTAL STUDY OF THE CIRCUIT PROPERTIES OF THE ECCENTRICALLY INSULATED ANTENNA
S. R. Mishra and Ronold W. P. King Jul. 1974 25 p refs
(Contract N00014-67-A-0298-0005; NR Proj. 371-016)
(AD-784973; TR-655) Avail: NTIS CSCL 09E

Techniques for measuring the admittance and distributions of current and charge along rotationally symmetrically insulated monopoles in a relatively dense ambient medium have been extended to include eccentrically insulated monopoles. Measured data on the admittance, current and charge distributions of such monopoles in fresh water are reported. A comparison of the measured data with the recently developed theory of Wu, Shen and King is also presented.
Author (GRA)

N75-15376# Academy of Sciences (USSR), Moscow.
ADAPTIVE CONTROL OF ACTIVE POWER CURRENTS IN ELECTRIC ENERGY NETWORKS
V. G. Davydov and R. P. Stroganov *In its* Probl. of Cybernetics 1974 p 240-243 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N75-14988 + Engineering Sciences Data Unit, London (England).
FLUID FORCES, PRESSURES AND MOMENTS ON RECTANGULAR BLOCKS
Jul. 1973 4 p Sponsored by Roy. Aeron. Soc., Inst. of Chem. Engr., Inst. of Mech. Engr., and Inst. of Struct. Engr.
(ESDU-71016-Amend-A-Amend-B) Copyright. Avail: NTIS HC $98.50

The pressure distribution on the surfaces of square sectioned blocks in a two dimensional flow condition is analyzed. The effect of flow inclination is examined. Graphs are presented to show the pressure distributions for angles of 15, 30, and 45 degrees. The approximate pressure distribution for a surface mounted cube in datum conditions is determined for the same angles of flow inclination. P.N.F.

N75-14989 Central Electricity Generating Board, London (England).
DRY-OUT MODEL IN TWO-PHASE FLOW
J.-P. Sursock Oct. 1973 39 p refs Transl. into ENGLISH from Rept. CEA-N-16665
(CE-Trans-6510; CEA-N-16665) Avail: Issuing Activity

A two-phase water-steam flow in a heated channel is experimentally studied. The critical flux is calculated by analysis of the evolution of the liquid film under the action of various elementary phenomena (evaporation, entrainment, and redeposition of the droplets) which are observed in experiments. Models are drawn up for calculating the effect of the elementary phenomena. The potential advantages of this modelization are (1) a better understanding of experimental results, and (2) the possibility of obaining information which will apply outside the zones investigated experimentally or under conditions which are difficult to reproduce. Author

N75-14990*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SURFACE HEAT TRANSFER COEFFICIENTS OF PIN-FINNED CYLINDERS
G. James VanFossen, Jr. Washington Jan. 1975 26 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Cleveland
(NASA-TM-X-3173; E-8125) Avail: NTIS HC $3.75 CSCL 20M

An experimental investigation was conducted to measure heat-transfer coefficients for a 15.24-centimeter-diameter cylinder with pin fins on its surface. Pin diameters of 0.3175 and 0.6350 centimeter with staggered pin spacings of 3 and 4 pin diameters and pin lengths of 5, 7, and 9 pin diameters were tested. Flow was normal to the axis of the cylinder, and local heat-transfer coefficients were measured as a function of angle around the circumference of the cylinder. The average heat-transfer coefficient was also computed. Reynolds number based on pin diameter ranged from 3600 to 27,750. The smallest diameter, closest spacing, and largest pin-length-to-diameter ratio gave the highest average effective heat-transfer coefficients. Author

N75-14991*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECTS OF VIBRATIONAL NONEQUILIBRIUM ON THE INVISCID DESIGN OF AN AXISYMMETRIC NOZZLE FOR HYPERSONIC FLOW
John B. Anders, Jr. Washington Jan. 1975 41 p refs
(NASA-TN-D-7801; L-9723) Avail: NTIS HC $3.75 CSCL 20D

An axisymmetric, hypersonic nozzle for arc-heated air is described. The method of characteristics is used to compute an inviscid nozzle contour in which vibrational nonequilibrium is approximated by the sudden-freeze technique. Chemical reactions are shown to freeze early in the nozzle expansion, and the result of vibrational and chemical freezing on the nozzle contour is demonstrated. The approximate nozzle design is analyzed by an exact calculation based on the method of characteristics for flow with vibrational nonequilibrium. Exit profiles are computed, and the usefulness of the approximate design is discussed. An analysis of the nozzle performance at off-design conditions is presented. Author

N75-14992*# Pennsylvania State Univ., University Park. Dept. of Aerospace Engineering.
THREE DIMENSIONAL FLOW FIELD IN ROCKET PUMP INDUCERS. PART 2: MEAN FLOW AND TURBULENCE CHARACTERISTICS INSIDE THE ROTOR PASSAGE, AND THEORETICAL ANALYSIS
B. Lakshminarayana and C. A. Gorton 27 Jan. 1975 47 p refs
(Grant NGL-39-009-007)
(NASA-CR-140916) Avail: NTIS HC $3.75 CSCL 20D

The measurement and prediction is reported of three dimensional flow fields in an axial flow inducer operating at a flow coefficient of 0.065 with air as the test medium. The experimental investigations included measurements of the blade static pressure and blade limiting streamline angle, and measurement of the three components of mean velocity, turbulence intensities and turbulence stresses at locations inside the inducer blade passage utilizing a rotating three-sensor hotwire probe. Analytical investigations were conducted to predict the three-dimensional inviscid flow. Total relative velocity distributions indicate a substantial velocity deficiency near the tip at mid-passage. High turbulence intensities and turbulence stresses are concentrated within this core region. Evidence of boundary layer interactions, blade blockage effects, radially inward flows, annulus wall effects and backflows are found to exist within the long, narrow passages of the inducer, emphasizing the complex nature of inducer flow which makes accurate prediction of the flow behavior extremely difficult. Author

N75-14993*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXPERIMENTAL AND ANALYTICAL SONIC NOZZLE DISCHARGE COEFFICIENTS FOR REYNOLDS NUMBERS UP TO 8 X 10 TO THE 6TH POWER
Andrew J. Szaniszlo Washington Jan. 1975 20 p refs
(NASA-TN-D-7848; E-8053) Avail: NTIS HC $3.25 CSCL 20D

Sonic discharge coefficients are obtained for two different geometry flow nozzles using high-pressure nitrogen gas (100 atm) with significant real-gas flow corrections. Throat Reynolds number range extended up to 8 million. Discharge coefficients for both nozzles monotonically increase in value at the high throat Reynolds numbers. The 95-percent confidence band for each nozzle is shown. Analytical discharge coefficients for the continuous and finite radius of curvature nozzle are presented. These analytical results for the laminar and turbulent boundary-layer cases are compared to experimental values for sonic flow. Experimental values are also compared to values calculated from the best empirical curve fit equation for subsonic flow. Author

N75-14994*# George Washington Univ., Washington, D.C. School of Engineering and Applied Science.
AN EXPERIMENTAL INVESTIGATION OF HEAT TRANSFER TO REUSABLE SURFACE INSULATION TILE ARRAY GAPS IN A TURBULENT BOUNDARY LAYER WITH PRESSURE GRADIENT M.S. Thesis
David Allen Throckmorton Feb. 1975 87 p refs Sponsored by NASA
(NASA-CR-141310) Avail: NTIS HC $4.75 CSCL 20D

An experimental investigation was performed to determine the effect of pressure gradient on the heat transfer to space shuttle reusable surface insulation (RSI) tile array gaps under thick, turbulent boundary layer conditions. Heat transfer and pressure measurements were obtained on a curved array of full-scale simulated RSI tiles in a tunnel wall boundary layer at a nominal freestream Mach number of 10.3 and freestream unit Reynolds numbers of 1.6, 3.3, and and 6.1 million per meter. Transverse pressure gradients were induced over the model surface by rotating the curved array with respect to the flow. Definition of the tunnel wall boundary layer flow was obtained by measurement of boundary layer pitot pressure profiles, and flat

plate wall pressure and heat transfer. Flat plate wall heat transfer data were correlated and a method was derived for prediction of smooth, curved array heat transfer in the highly three-dimensional tunnel wall boundary layer flow and simulation of full-scale space shuttle vehicle pressure gradient levels was assessed. Author

N75-14995*# Virginia Univ., Charlottesville. School of Engineering and Applied Science.
SECOND-ORDER SMALL DISTURBANCE THEORY FOR HYPERSONIC FLOW OVER POWER-LAW BODIES Ph.D. Thesis
James C. Townsend 20 Dec. 1974 158 p refs Sponsored by NASA
(Contract N00014-70-A-0362)
(NASA-CR-141308) Avail: NTIS HC $6.25 CSCL 20D

A mathematical method for determining the flow field about power-law bodies in hypersonic flow conditions is developed. The second-order solutions, which reflect the effects of the second-order terms in the equations, are obtained by applying the method of small perturbations in terms of body slenderness parameter to the zeroth-order solutions. The method is applied by writing each flow variable as the sum of a zeroth-order and a perturbation function, each multiplied by the axial variable raised to a power. The similarity solutions are developed for infinite Mach number. All results obtained are for no flow through the body surface (as a boundary condition), but the derivation indicates that small amounts of blowing or suction through the wall can be accommodated. Author

N75-14996*# TRW Systems Group, Redondo Beach, Calif.
COMPUTER PROGRAM GRADE FOR DESIGN AND ANALYSIS OF GRADED-POROSITY HEAT-PIPE WICKS
J. E. Eninger Aug. 1974 62 p
(Contract NAS2-8310)
(NASA-CR-137618) Avail: NTIS HC $4.25 CSCL 20M

A computer program for numerical solution of differential equations that describe heat pipes with graded-porosity fibrous wicks is discussed. A mathematical problem is provided with a summary of the input and output steps used to solve it. The program is also applied to the analysis of a typical heat pipe. N.E.R.

N75-14997*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LIQUID JET PUMPED BY RISING GAS BUBBLES
Nihad A. Hussain (California State Univ., San Diego) and Robert Siegel 1975 9 p refs Proposed for presentation at Fluids Eng. Conf., Minneapolis, 5-7 May 1975; sponsored by ASME
(NASA-TM-X-71640) Avail: NTIS HC $3.25 CSCL 20D

A two-phase mathematical model is proposed for calculating the induced turbulent vertical liquid flow. Bubbles provide a large buoyancy force and the associated drag on the liquid moves the liquid upward. The liquid pumped upward consists of the bubble wakes and the liquid brought into the jet region by turbulent entrainment. The expansion of the gas bubbles as they rise through the liquid is taken into account. The continuity and momentum equations are solved numerically for an axisymmetric air jet submerged in water. Water pumping rates are obtained as a function of air flow rate and depth of submergence. Comparisons are made with limited experimental information in the literature. Author

N75-14998*# Scientific Translation Service, Santa Barbara, Calif.
FLOW OF VISCOUS FLUID IN SPHERICAL LAYERS (REVIEW)
I. M. Yavorskaya and N. M. Astafyeva Washington NASA Jan. 1975 37 p refs Transl. into ENGLISH of "Techeniye vyazkoy zhidkosti v sfericheskikh sloyakh" (Moscow), Rept. Ob-10 Acad. of Sci. of the USSR, 1974 42 p
(Contract NASw-2483)
(NASA-TT-F-16106; OB-10) Avail: NTIS HC $3.75 CSCL 20D

A review is presented of works devoted to the study of hydrodynamic motions of a fluid in spherical layers and their stability. The investigation of such flow with various values of physical parameters and various boundary conditions is of significant interest for problems of astro- and geophysics with respect to problems of global circulation in stellar envelopes and large scale flow in planetary atmospheres. Author

N75-14999*# Scientific Translation Service, Santa Barbara, Calif.
NATURE OF THE INFLUENCE OF THE UNIT REYNOLDS NUMBER ON SUPERSONIC BOUNDARY LAYER TRANSITION
A. M. Kharitonov and V. V. Chernykh Washington NASA Jan. 1975 10 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Mekh. Zhidk. Gaza (USSR), Jul.-Aug. 1974 p 150-153
(Contract NASw-2483)
(NASA-TT-F-16146) Avail: NTIS HC $3.25 CSCL 20D

The experiments were conducted in several wind tunnels with freestream Mach numbers ranging from 2 to 6 and unit Reynolds numbers of (10 to 60) by 1,000,000/m. In this range of flow parameters, a qualitative correlation was observed in the changes in transition Reynolds number and pressure pulsations with increasing unit Reynolds number. A correlation parameter accounting for the intensity and scale of disturbances is proposed for generalizing available experimental data. It is shown that the effect of the unit Reynolds number is equivalent to the combined influence of acoustic disturbances and of the leading-edge bluntness of the model on transition. Author

N75-15000# Aeronautical Research Inst. of Sweden, Stockholm.
PIPE FLOW CALIBRATION OF PRESTON TUBES OF DIFFERENT DIAMETERS AND RELATIVE LENGTHS INCLUDING RECOMMENDATIONS ON DATA PRESENTATION FOR BEST ACCURACY
Arild Bertelrud Sep. 1974 95 p refs
(FFA-125) Avail: NTIS HC $4.75

Preston tubes of different diameters and length-to-diameter ratios were tested in incompressible pipe flow at Reynolds numbers of 60,000 to 300,000. The results show differences of the same order of magnitude as the various calibration curves suggested in the literature. Different ways of expressing the data have been considered and it is concluded that the traditional parameters are not suitable. Diagrams of the test equipment and conditions are provided. Tables of data and graphs of the performance obtained under various conditions are included. Author

N75-15001# Australian National Univ., Canberra. Dept. of Physics.
HIGH ENTHALPY NONEQUILIBRIUM CARBON DIOXIDE NOZZLE AND WEDGE FLOWS. EXPERIMENT AND CALCULATIONS
N. A. Ebrahim and H. G. Hornung 21 Jan. 1975 35 p Backup document for AIAA Synoptic scheduled for publication in AIAA Journal in July 1975
Avail: NTIS HC $3.75

An experimental survey of the nozzle flow in a free piston shock tunnel is made by measuring static pressure, pitot pressure, and density. The results are compared with numerical calculations and the good agreement confirms the predicted degree of nonequilibrium and its variation with temperature over a specific reservoir enthalpy range of 14 deg to 40 deg cm25-2. Interferograms of flow over wedges show that while vibrational relaxation is unimportant in nozzle flows, the vibrational relaxation of CO and CO2 has to be taken into account in flow over models at low enthalpy. At high enthalpy, ionization becomes important because of the strong effect of electrons on the gas refractivity. Author

N75-15002# Oregon State Univ., Corvallis. Dept. of Mechanical Engineering.
NATURAL CONVECTION HEAT TRANSFER IN LIQUID METALS Progress Report, 1 Jan. - 31 Dec. 1973
J. R. Welty Dec. 1973 48 p refs
(Contract AT(45-1)-2227)
(RLO-2227-T4-4) Avail: NTIS HC $3.75

Research progress for the reporting period is reported on: (1) natural convection studies in mercury confined between two vertical heated pipes, and (2) natural convection heat transfer studies in mercury adjacent to a vertical cylinder with constant heat flux. A bibliography of publications developed on the project for prior years is presented. Author (NSA)

N75-15003# Houston Univ., Tex. Dept. of Mechanical Engineering.
VAPOR EXPLOSION: HEAT TRANSFER AND FRAGMENTATION Final Report
L. C. Witte and J. E. Cox Mar. 1974 16 p refs
(Contract AT(40-1)-3936)
(ORO-3936-12) Avail: NTIS HC $3.25

This final report describes work performed during a 4 and 1/2 year period concerning rapid vapor formation. Experimental and theoretical results are discussed briefly. The present state-of-understanding of the vapor explosion phenomenon is presented. A complete listing of reports, theses, dissertations and published papers resulting from the contract is given.
Author (NSA)

N75-15004# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany). Inst. fuer Raumsimulation.
HEAT TRANSFER MEASUREMENTS AND FLOW MECHANICAL INVESTIGATIONS ON AFTER COOLERS OF ROOTS-TYPE PUMPS
Hans Hamacher 6 May 1974 37 p refs In GERMAN; ENGLISH summary
(DLR-FB-74-35) Avail: NTIS HC $3.75; DFVLR, Porz, West Ger. 16,30 DM

Heat transfer and flow measurements were carried out on aftercoolers of Roots-type pumps. Heat transfer was determined by using a cooler of the multistage Roots pump set, which is connected to a space simulation chamber. Measurements were conducted with the total cooler as well as with single segments parallel to the pump axis. Flow rate distribution of the returning gas, when the gas enters from the high pressure side across the width of the cooler, was measured using a flow model.
ESRO

N75-15005# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
FLOW REGIMES IN TWO DIMENSIONAL RIBBED DIFFUSERS Final Report, Oct. 1970 - Jun. 1971
Frank D. Stull Jun. 1974 50 p refs
(AF Proj. 3012)
(AD-786887; AFAPL-TR-74-26) Avail: NTIS CSCL 20/4

Water table flow visualization tests of a straight wall diffuser and corresponding ribbed diffuser were conducted over a wide range of total divergence angles and diffuser length to throat width ratios. Rib parameters such as inter-rib cavity depth to width ratio, inter-rib cavity width, rib thickness and number of ribs were varied, as well as rib contour. Motion pictures were obtained of the secondary flow patterns occurring within the inter-rib cavities, and hot film measurements were made to determine the extent of velocity fluctuations induced by the cavities. In general, the addition of ribs increased the no-appreciable stall regime by increasing velocity fluctuations near the wall of the diffuser, thereby promoting momentum exchange.
Author (GRA)

N75-15006# Army Advanced Ballistic Missile Defense Agency, Huntsville, Ala.
A MICROWAVE TRANSPARENT METHOD OF COOLING MICROWAVE COMPONENTS, WITH PRACTICAL RESULTS
B. L. Smith, H. L. Bassett, J. M. Schuchardt, and G. T. Colwell 1974 11 p
(AD-785682) Avail: NTIS CSCL 09/1

Microwave considerations often limit the means available for cooling waveguide-mounted components, to the detriment of performance. In fact, in high power microwave windows, thermal cracking is the usual average power limitation. The problem is further aggravated of the window is thin; heat conduction is along the long dimension of Figure 1a causing a maximum heat path length. It would be much better if heat could be made to flow laterally along the short path, and be removed directly from the faces of the heated areas. The paper describes a way to remove the heat as desired, using the heat pipe principle in a unique manner to provide a cooling path that has an effective conductivity much greater than that of solid copper, but is at the same time microwave transparent. The design of a working model of a heat pipe cooled microwave window is discussed.
GRA

N75-15007# Naval Ship Research and Development Center, Bethesda, Md.
FLOW SEPARATION, REATTACHMENT, AND VENTILATION OF FOILS WITH SHARP LEADING EDGE AT LOW REYNOLDS NUMBER
Richard Heckel and Goodwin Ober May 1974 21 p
(AD-787500; NSRDC-4390) Avail: NTIS CSCL 20/4

Two two-dimensional foils (a wedge and a modified Tulin two-term foil) were used to study the ventilation of foils with sharp leading edges at low Reynolds number. Flow visualization by dye injection techniques and by tufts was used to determine the reattachment point of the separated streamline in nonventilated flow. The results indicate that if air is forced into a separated region, it is possible to achieve a fully developed cavity. This can be accomplished at speeds too low for any cavitation to occur by resorting to relatively high angles of attack. Hence, it is possible to go directly from noncavitating flow to fully developed cavity flow. Results of pressure measurements over the surface of the curved foil are included.
Author (GRA)

N75-15008# Naval Ship Research and Development Center, Bethesda, Md.
THE EFFECT OF NOSE RADIUS ON THE CAVITATION-INCEPTION CHARACTERISTICS OF TWO-DIMENSIONAL HYDROFOILS
Daniel T. Valentine Jul. 1974 49 p refs
(AD-785834; NSRDC-3813) Avail: NTIS CSCL 13/10

Results of an analytical investigation of the cavitation properties of modified marine propeller-type hydrofoils are presented. In particular, dependence of the critical cavitation number and the cavitation-free, angle-of-incidence range on changes in the leading-edge thickness is determined. It is shown that within a narrow range of changes of leading-edge thickness, a delay in inception is possible, depending on the design problem under consideration. An increase in critical inception speed, accompanied by a sacrifice in some of the cavitation-free, angle-of-incidence range occurs for a small increase in the leading-edge thickness. A range of thickness changes exists for which beneficial results can be obtained.
Author (GRA)

N75-15009# Naval Ship Research and Development Center, Bethesda, Md.
TURBULENT BOUNDARY LAYER AND VISCOUS RESISTANCE OF A SUBMARINE AT HIGH REYNOLDS NUMBER
William G. Souders May 1974 30 p refs
(SF35421003)
(AD-786380; NSRDC-4366) Avail: NTIS CSCL 20/4

A limited amount of data about turbulent boundary layers, obtained on a full-scale submarine, is presented. Mean wall-shear stresses were measured at four hull locations with Preston tubes, and mean velocity profiles in the boundary layer were measured at one hull location with pitot tubes. These measurements were made over a range of Reynolds numbers from 11 to 300 million. The measured profile for boundary-layer velocity, both full-scale and model, are seen to agree well with the velocity-similarity laws, and the measurements of shear-stress distribution agree with a solution of the momentum equation for a body of revolution.
Author (GRA)

N75-15010# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
THE ELIMINATION OR CONTROL OF MATERIAL PROBLEMS IN WATER HEAT PIPES Quarterly Progress Report, 1 Jan. - 31 Mar. 1974
G. F. Pittinato Apr. 1974 25 p refs
(Grant NSF GI-41310)
(PB-233936/4; MDC-G5481; NSF/RA/N-74-037) Avail: NTIS HC $3.25 CSCL 13K

A definition was made of a water heat pipe associated with a parabolic cylindrical solar collector that will operate in the temperature range of ambient to 300 C. A literature survey was conducted on the problem of noncondensable gas generation in water heat pipes. The design of the heat pipes was completed. Eight different alloys were selected for evaluation as candidate materials for water heat pipes. (Modified author abstract) GRA

N75-15011# Naval Ship Research and Development Center, Bethesda, Md.
THE PREDICTION OF TRANSITION FROM LAMINAR TO TURBULENT FLOW IN BOUNDARY LAYERS ON BODIES OF REVOLUTION
S. Granville Sep. 1974 39 p refs
(UR1230103)
(AD-787060; NSRDC-3900) Avail: NTIS CSCL 20D

Existing methods for predicting transition from laminar to turbulent flow in boundary layers on smooth bodies of revolution immersed in axisymmetric flows with very low background turbulence are examined critically. Several are compared to available experimental results. A new correlation is then proposed which incorporates not only the usual effect of pressure gradients but also the effect of axisymmetric spreading of the boundary layer on the location of transition. Author (GRA)

N75-15012# Naval Postgraduate School, Monterey, Calif.
FORCES ON CYLINDERS AND SPHERES IN AN OSCILLATING FLUID M.S. Thesis
Olcay Tuter Sep. 1974 91 p refs
(AD-787366) Avail: NTIS CSCL 20/4

The in-line and lateral forces acting on cylinders and the in-line force acting on spheres placed in an harmonically oscillating flow have been measured. The periodic flow has been generated in a U-shaped channel through the use of a pneumatic oscillator. The drag, inertia, and lift coefficients as well as the total force coefficient have been determined through the use of Fourier analysis. (Modified author abstract) GRA

N75-15013# Technology, Inc., Dayton, Ohio.
THE USE OF CROCCO TYPE VARIABLES IN THE SOLUTION OF BOUNDARY LAYER PROBLEMS Final Report, May - Sep. 1973
R. T. Davis Jul. 1974 58 p refs
(Contract F33615-71-C-1463; AF Proj. 7064)
(AD-787224; ARL-74-0059) Avail: NTIS CSCL 20/4

The use of Crocco type variables for calculating laminar, transitional, and turbulent boundary layer flows has been investigated. It is shown that they possess some advantages (as well as disadvantages) over Levy-Lees variables. Although the development of numerical methods for solving the boundary layer equations for even three dimensional compressible flows has reached the point where numerical techniques are well developed and accurate numerical solutions can be obtained from a variety of existing techniques, many problems still exist in doing these calculations, most of which are not numerical in nature. There is a need to develop more appropriate dependent and independent variables in order to make the numerical scheme as fast as possible. (Modified author abstract) GRA

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N75-15014* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AUTOMATIC FOCUS CONTROL FOR FACSIMILE CAMERAS Patent
Archibald R. Sinclair, Ernest E. Burcher, and Stephen J. Katzberg, inventors (to NASA) Issued 24 Dec. 1974 6 p Filed 15 Oct. 1973 Supersedes N74-10420 (12 - 01, p 0053)
(NASA-Case-LAR-11213-1; US-Patent-3,857,031; US-Patent-Appl-SN-406715; US-Patent-Class-250-201; US-Patent-Class-356-4) Avail: US Patent Office CSCL 14E

An electronic circuit for controlling the focus of facsimile cameras is described. The circuit consists of balanced a.c. amplifiers, two square law function generators, and a differential amplifier and power drive. The invention includes a method for maintaining the imaging sensor at the expected location of the focal plane as the facsimile camera scans a scene or terrain. A block diagram of the electronic circuitry is provided. P.N.F.

N75-15015*# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
STUDY OF MULTIPLE HOLOGRAM RECORDING IN LITHIUM NIOBATE Final Report, 1 Oct. 1973 - 31 Oct. 1974
T. K. Gaylord and W. R. Callen Oct. 1974 55 p refs
(Contract NAS8-30246; Proj. E-21-633)
(NASA-CR-120520) Avail: NTIS HC $4.25 CSCL 14E

The results of detailed experimental and theoretical considerations relating to multiple hologram recording in lithium niobate are reported. The following problem areas are identified and discussed: (1) the angular selectivity of the stored holograms, (2) interference effects due to the crystal surfaces, (3) beam divergence effects, (4) material recording sensitivity, and (5) scattered light from material inhomogeneities. Author

N75-15016*# Stanford Univ., Calif. High Energy Physics Lab.
TO PERFORM A GYRO TEST OF GENERAL RELATIVITY IN A SATELLITE AND DEVELOP ASSOCIATED CONTROL TECHNOLOGY Annual Report, 1973 - 1974
W. M. Fairbank, C. W. F. Everitt, and D. B. DeBra Nov. 1974 41 p Sponsored by NASA
(NASA-CR-141290) Avail: NTIS HC $3.75 CSCL 17G

Performance tests of gyroscope operations and gyroscope readout equipment are discussed. The gyroscope was tested for 400 hours at liquid helium temperatures with spin speeds up to 30 Hz. Readout by observing trapped magnetic flux in the spinning rotor with a sensitive magnetometer was accomplished. Application of the gyroscope to space probes and shuttle vehicles. Author

N75-15017*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MINIATURE PROBES FOR USE IN GAS TURBINE TESTING
George E. Glawe and Lloyd N. Krause 1974 15 p refs Presented at Automative Eng. Conf., Detroit, 24-28 Feb. 1974, sponsored by Soc. of Automative Engr.
(NASA-TM-X-71638) Avail: NTIS HC $3.25 CSCL 14B

Several examples of miniature probes (null type as well as fixed position) are presented which have proved useful in aircraft and space power systems component testing and are applicable to automotive gas turbine testing. These probes are used to determine component or system performance from the measurement of gas temperature as well as total and static pressure, and flow direction. Detailed drawings of the sensors are presented along with experimental data covering the flow characteristics over the range of intended use. Author

N75-15018*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ION AND ELECTRON TEMPERATURES IN THE SUMMA MIRROR DEVICE BY EMISSION SPECTROSCOPY
R. W. Patch, D. E. Voss, J. J. Reinmann, and A. Snyder 1974 39 p refs Presented at 16th Ann. Meeting of the Plasma Phys. Div. of the Am. Phys. Soc., Albuquerque, New Mexico, 28-31 Oct. 1974
(NASA-TM-X-71635; E-8169) Avail: NTIS HC $3.75 CSCL 14B

Ion and electron temperatures, and ion drift were measured in a superconducting magnetic mirror apparatus by observing the Doppler-broadened charge-exchange component of the 667.8 and 587.6 nanometer He lines in He plasma, and the H sub alpha and H sub beta lines in H2 plasma. The second moment of the line profiles was used as the parameter for determining ion temperature. Corrections for magnetic splitting, fine structure, monochromator slit function, and variation in charge-exchange cross section with energy are included. Electron temperatures were measured by the line ratio method for the corona model, and correlations of ion and electron temperatures with plasma parameters are presented. Author

N75-15019*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SUN ANGLE CALCULATOR Patent Application
Anne Flippin (Kentron Hawaii) and Arthur L. Schmitt, inventors (to NASA) Filed 11 Dec. 1974 13 p
(NASA-Case-MSC-12617-1; US-Patent-Appl-SN-531576) Avail: NTIS HC $3.25 CSCL 14B

A calculator apparatus for determining the angle of the sun relative to the horizon at any given place and time on the earth is described. A diagram of the calculator is provided and the method of operation is explained. The device limits the requirements for the use of solar tables and lengthy calculations involved in the present methods. NASA

N75-15020# California Univ., Livermore. Lawrence Livermore Lab.
CHARACTERISTICS OF THE OPTICAL MULTICHANNEL ANALYZER AS A SPECTROSCOPIC DETECTOR
R. A. Saroyan 30 May 1974 36 p
(Contract W-7405-eng-48)
(UCID-16497) Avail: NTIS HC $3.75

Data and experiences gathered from using the SSRI Optical Multichannel Analyzer as a spectroscopic detector are presented. Model 1205B is discussed and compared to Model 1205F. Operating hints for the system and examples of its use in spectroscopy are given. This paper is an informal supplement to the SSRI manual, which is oriented toward the computer characteristics of the analyzer rather than the detector characteristics. Author (NSA)

N75-15021# Oak Ridge National Lab., Tenn.
THEORETICAL COMPARISON OF SINGLY-MULTIPLEXED HADAMARD TRANSFORM SPECTROMETERS TO SCANNING SPECTROMETERS
N. M. Larson, R. Crosmun, and Y. Talmi Jul. 1974 36 p refs
(Contract W-7405-eng-26)
(ORNL-TM-4603) Avail: NTIS HC $3.75

A general mathematical framework within which the relative performance of singly-multiplexed Hadamard Transform Spectrometers (HTS) and conventional scanning spectrometers may be compared is presented. The theoretical multiplex advantage (Fellgett advantage) is calculated for spectrometers operating in two spectral regions. Predictions are verified by computer simulation of various characteristic spectra. Based on these results some conclusions concerning the practical application of HTS systems are presented. Author (NSA)

N75-15022# Teledyne Electronics, Newbury, Calif.
PULSED RF FREQUENCY MEASUREMENT FOR BUILT-IN-TEST EQUIPMENT (BITE) Final Report, Jul. 1973 - Mar. 1974
J. W. Memmen Sep. 1974 49 p
(Contract DAAB07-73-C-0253; DA Proj. 1S7-62705-AH-94)
(AD-785736; ECOM-73-0253-F) Avail: NTIS CSCL 14B

The objective of the research and development program was to demonstrate the feasibility of a Pulsed RF Frequency Measurement device suitable for applications to Built-In-Test Equipment (BITE) that could be applied to various IFF and Radar equipments to monitor the carrier frequency of the RF pulses. To this end a study of pulsed RF frequency measurement methods was conducted. A technique involving a fast-gated, phase-lock loop was selected as optimum for the pulsed RF frequency measurement research and development. Various circuit functions of a fast-gated, phase-lock loop were designed and evaluated. The optimized circuit design was then integrated into a complete phase-lock loop design. A feasibility model of the pulsed RF frequency monitor was built and successfully tested. Author (GRA)

N75-15023# Cornell Univ., Ithaca, N.Y. Materials Science Center.
NOISE IN THE RF SQUID
L. D. Jackel and R. A. Buhrman 1 Oct. 1974 105 p refs
(Contract N00014-67-A-0077-0016; NR Proj. 319-032)
(AD-787010; MSC-2321; TR-23) Avail: NTIS CSCL 14/2

The paper presents the results of an extensive study of the sensitivity limiting noise sources in rf-biased SQUID flux detectors. The investigation included both experiments with point contact and thin film SQUIDs and digital computer simulations. (Modified author abstract) GRA

N75-15024# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
ENGINE FAILURE PREDICTION (ION) PROBE PROGRAM Final Technical Report, Feb. 1971 - May 1974
Richard L. Hall and Wayne M. Shaffernocker Jun. 1974 50 p refs
(Contract F33615-73-C-2048)
(AD-786889/6; AFAPL-TR-74-46) Avail: NTIS HC $3.75 CSCL 21/5

The program reported herein was directed toward the evaluation of the electrical ion probe developed by the Air Force Flight Dynamics Laboratory. Extensive testing was conducted in an effort to determine the potential utility of the ion probe system. Detailed descriptions of the testing performed and the resulting conclusions are provided. Author (GRA)

N75-15025# Fairchild Space and Defense Systems, Syosset, N.Y.
ARTILLERY-LAUNCHED CHARGE-COUPLED DEVICE (CCD) Final Report, 3 Dec. 1973 - 15 Apr. 1974
Edward Willett and Harold Forst Jun. 1974 78 p refs
(Contract DAAD05-74-C-0732)
(AD-786697; ED-AX-41; LWL-74-69) Avail: NTIS CSCL 19/1

The report discusses the test, evaluation, and analysis of a charged coupled device (CCD) imagery system as might be deployed in artillery launched, parachute dropped, aerial reconnaissance system. An existing 100 x 100 element CCD camera was evaluated for image usefulness when deployed from a parachute. A system analysis was performed on how future 488 x 390 element CCD sensors might be used and the expected performance. It was concluded that the existing 100 x 100 element sensor provided useful information and that the 488 x 390 would do even better. An artillery launched TV system is easily within the state of the art. Winds over the target area would increase camera coverage but must be taken into account when it is desired to deploy the system over specific target coordinates. Author (GRA)

N75-15026# Stanford Univ., Calif. Electronics Labs.
EXTENDED RANGE SPATIAL FILTERS FOR IMAGE DEBLURRING
Daniel A. Tichenor May 1964 142 p refs Sponsored in part by Sandia Labs. and Army Electronics Command
(Contract N00014-67-A-0112-0044)
(AD-785904; SU-SEL-74-008; SU-TR-6418-3) Avail: NTIS CSCL 14/5

Photographic images degraded by linear, spatially-invariant blurs can often be restored using an inverse or estimation filter in a coherent optical processor. In this procedure the degraded image is input to the processor as a photographic transparency. The spatial spectrum of the image is modified by a spatial filter and inverse transformed to obtain the restored image. The dynamic range of the spatial filter places an upper bound on the performance that can be achieved. This thesis demonstrates a new method for generating spatial filters with large dynamic ranges, and derives limitations inherent in the application of such filters to image restoration. (Modified author abstract) GRA

N75-15027# Aerospace Corp., El Segundo, Calif. Lab. Operations.
USE OF POLISHED FUSED SILICA TO STANDARDIZE DIRECTIONAL POLARIZED EMITTANCE AND REFLECTANCE MEASUREMENTS IN THE INFRARED
R. J. Champetier and G. J. Friese 9 Aug. 1974 76 p refs
(AD-786783; TR-0075(5450-60)-1) Avail: NTIS CSCL 14/2

The results of a round robin of measurements for the purpose of standardizing infrared directional emittance and reflectance apparatus in three laboratories are presented. Polarizers were incorporated in two of the devices, which have dispersing monochromators in their optical paths. Samples of bare polished fused silica as well as gold evaporated on polished nickel were the basis for the calibration. Their directional polarized properties were independently computed using published optical

constants, and are presented here. (Modified author abstract) GRA

36 LASERS AND MASERS

Includes parametric amplifiers.

N75-15028* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CLEAR AIR TURBULENCE DETECTOR Patent
Werner K. Dahm (Raytheon Co., Sudbury, Mass.), Donald J. Delgrego (Raytheon Co., Sudbury, Mass.), Irving Goldstein (Raytheon Co., Sudbury, Mass.), Robert M. Huffaker (Raytheon Co., Sudbury, Mass.), Albert V. Jelalian (Raytheon Co., Sudbury, Mass.), Wayne H. Keene (Raytheon Co., Sudbury, Mass.), Perry A. Miles (Raytheon Co., Sudbury, Mass.), and Charles M. Sonnenschein, inventors (to NASA) (Raytheon Co., Sudbury, Mass.) Issued 24 Dec. 1974 14 p
Filed 11 Apr. 1973 Supersedes N73-21523 (11 - 12, p 1442) Sponsored by NASA
(NASA-Case-MFS-21244-1; US-Patent-3,856,402; US-Patent-Appl-SN-350249; US-Patent-Class-356-5; US-Patent-Class-356-28; US-Patent-Class-356-103) Avail: US Patent Office CSCL 20E

A system to be employed by an aircraft for the detection of clear air turbulence is described. The system employs a laser light beam which is directed ahead of the aircraft along the flight path. The portion of the light reflected back to the aircraft by atmospheric aerosol is detected and analyzed for Doppler shift. The velocity and intensity of the turbulence is determined by the type and amount of the light reflected. Official Gazette of the U.S. Patent Office

N75-15029* National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD OF PRODUCING A STORAGE BULB FOR AN ATOMIC HYDROGEN MASER Patent
Hubert Erpenbach, inventor (to NASA) (JPL) Issued 7 Jan. 1975 4 p Filed 22 Dec. 1972 Supersedes N73-18508 (11 - 09, p 1043) Sponsored by NASA
(NASA-Case-NPO-13050-1; US-Patent-3,859,119; US-Patent-Appl-SN-317567; US-Patent-Class-117-97; US-Patent-Class-117-95; US-Patent-Class-330-4; US-Patent-Class-332-7.5) Avail: US Patent Office CSCL 20E

A storage bulb for an atomic hydrogen maser is produced by coating its internal surface with an emulsion containing both TFE and FEP particles. The emulsion is produced by mixing a first quantity of TFE in an aqueous dispersion with a second quantity of FEP in an aqueous dispersion, with a third quantity of distilled water. The emulsion is poured into the bulb to coat it uniformly so as to form a thin film of emulsion on the bulb's internal surface. After excess emulsion is drained out of the bulb the emulsion in the bulb is dried to remove the water and most of the aqueous matter therefrom. The remaining emulsion is then cured by heating the bulb to a temperature of at least 380 C. Official Gazette of the U.S. Patent Office

N75-15030*# Rensselaer Polytechnic Inst., Troy, N.Y. School of Engineering.
DESIGN OF A LASER RANGEFINDER FOR MARTIAN TERRAIN MEASUREMENTS M.S. Thesis
Daniel L. Palumbo Mar. 1973 56 p refs
(Grant NGL-33-018-091)
(NASA-CR-141320; RPI-TR-MP-37) Avail: NTIS HC $4.25 CSCL 20E

Methods for using a laser for rangefinding are discussed. These are: (1) Optical Focusing, (2) the Phase Difference Method, and (3) Timed Pulse. For application on a Mars Rover, the Timed Pulse Method proves to be the better choice in view of the requirements set down. This is made possible by pulse expansion techniques described in detail. Initial steps taken toward building the range finder are given, followed by a conclusion which is actually a proposal for future steps. Author

N75-15031# California Univ., Livermore. Lawrence Livermore Lab.
LASER-FUSION PROGRAM Semiannual Report, Jul. - Dec. 1973
10 Apr. 1974 175 p refs
(Contract W-7405-eng-48)
(UCRL-50021-73-2) Avail: NTIS HC $6.25

Summaries are given of research in the following areas: (1) program overview, (2) solid-state lasers, (3) design analysis, (4) component development, (5) diagnostics, (6) laser fusion, (7) laser-plasma, experimental and theoretical, (8) basic studies and advanced concepts, (9) isotope separation, (10) propagation, (11) gas laser research and technology, (12) CO2 laser program, and (13) program resources. NSA

N75-15032# Bendix Research Labs., Southfield, Mich.
CUEING SYSTEM FEASIBILITY STUDY Final Report
G. E. Busch Aug. 1974 78 p refs Sponsored in part by Army Missile Command, Redstone Arsenal, Ala.
(AD-785710; BRL-7264) Avail: NTIS CSCL 17/8

The concept feasibility and proposed trial design of a very compact and low-cost laser cuer and hand-held viewer/receiver for target acquisition has been investigated. The concept utilizes a disposable neodymium-type laser pulser, to be directed at enemy targets by forward personnel, and a complementary viewer by a standoff weapons system. The laser concept features a photoflash-pumped neodymium:YAG laser which is not Q-switched. The design analysis indicates that the target cue can be visually superimposed as a light-spot on the operator's real-scene view, in true position and with adequate visual contrast. The viewer design permits the optional use of RF synchronization of the trigger pulse of a Q-switched laser used by the forward observer with the electronic gate in the image tube at the weapons delivery system. The analysis also includes consideration of signal-to-noise, weight, and specification projections, in addition to budgetary estimates of production costs for both the laser and the viewer. (Modified author abstract) GRA

N75-15033# Technische Hochschule, Darmstadt (West Germany).
RESEARCH ON SHORT DURATION ON PULSED RADIATION SOURCES Interim Scientific Report, 1 Jun. 1973 - 28 Feb. 1974
Heinz Fischer Apr. 1974 25 p refs
(Grant AF-AFOSR-2402-72; AF Proj. 9767)
(AD-783230; EOARD-TR-75-4) Avail: NTIS CSCL 20/5

A nitrogen laser which combined the Nanolite pulser with a resonator geometry resulted in a low threshold (3.3 kV) and a 100 kW laser output in the case of a 14 kV pulse voltage. Thus the energy conversion efficiency rose to 0.35%. The beam divergence was reduced to approximately 1 mrad by the resonator. This represents considerable progress in regard to efficient, low voltage and high repetition rate nitrogen laser operation. The study to correlate soft X-ray spots with the hard radiation in a 1 kJ plasma focus showed that field structures leading to the appearance of soft X-ray spots are always present in this plasma focus. These field structures represent m = 0 plasma instabilities and do have a direct influence upon the observed neutron emission. Author (GRA)

N75-15034# Manlabs, Inc., Cambridge, Mass.
DEVELOPMENT OF POLYCRYSTALLINE ALKALI HALIDES BY STRAIN RECRYSTALLIZATION FOR USE AS HIGH ENERGY INFRARED LASER WINDOWS Final Technical Report, Feb. - Oct. 1973
S. A. Kulin, P. P. Neshe, and K. Kreder Jan. 1974 52 p ref
(Contract F33615-73-C-5078)
(AD-786030; AFML-TR-74-17) Avail: NTIS CSCL 20/5

The compressive deformation processing of pure KCl and KCl single crystals alloyed with Eu, Rb or Br has been investigated. The variables evaluated in this infrared alloy window fabrication process included temperature, total strain, strain rate, heating and cooling cycles, and quality and orientation of the single crystal starting material. Experimental conditions required to produce crack-free windows were established. Mechanical testing and microstructural observations were performed on such windows. This work has shown the feasibility of producing KCl alloy windows having high mechanical strengths. Further, processing conditions were developed which appear to establish

the feasibility of scale-up for the fabrication of windows of very large sizes. Author (GRA)

N75-15035# Hughes Research Labs., Malibu, Calif.
PLASMA CATHODE FOR E-BEAM LASERS Semiannual Technical Report, 1 Jan. - 30 Jun. 1974
John R. Bayless Sep. 1974 50 p refs
(Contract N00014-72-C-0496)
(AD-786745) Avail: NTIS CSCL 20/5

The objective of this program is to develop the plasma cathode electron gun and to demonstrate that it has properties which make it suitable for application to E-beam lasers. The source of electrons in this new and advanced electron device is a plasma generated within a low-voltage hollow-cathode discharge; a thermionic emitter is not required. Electrons extracted from the plasma pass through a triode-type control grid structure and are accelerated to high energies in a plasma-free region prior to emerging from the gun through a thin foil window. The device, which is capable of both pulsed and CW operation, is characterized by durability, low cost, low power consumption, minimal pumping requirements, small size, and fast turn-on in comparison to thermionic E-guns. GRA

N75-15036# Battelle Columbus Labs., Ohio.
FABRICATION OF BaF2 INFRARED WINDOWS Final Technical Report, 1 Dec. 1973 - 31 Aug. 1974
A. E. Austin, J. J. Mueller, J. F. Miller, and K. C. Brog 30 Sep. 1974 68 p refs
(Contract DAAH01-74-C-0358; DA Proj. 1T6-62609-A-308)
(AD-786679; RK-CR-75-11) Avail: NTIS CSCL 20/5

The feasibility was investigated of the fabrication of polycrystalline BaF2 windows for infrared lasers by the hot isostatic pressing process (HIP). A method of treatment with HF gas for the preparation and surface cleanup of the BaF2 powder was developed. The HIP conditions for densification, sintering and grain growth of BaF2 bodies were determined. Light transmission through the BaF2 windows was found to be limited by scattering by intergranular gaseous pores or intragranular voids. The HIP process by the present techniques amenable for the fabrication of windows for use with high power infrared lasers.
Author (GRA)

N75-15037# Air Force Academy, Colo. Frank J. Seiler Research Lab.
AN EXPERIMENTAL INVESTIGATION OF THE FLOW IN AN INTERSTAGE CONNECTING DUCT FOR USE ON A HIGH POWER GASDYNAMIC LASER. 1: GAS CHROMATOGRAPH STUDIES
Robert A. Golobic and David H. Quick Aug. 1974 35 p refs
(AF Proj. 7905)
(AD-786463; SRL-TR-74-0016) Avail: NTIS CSCL 20/5

A model of a duct used to optically connect to high-power gasdynamic lasers was tested employing the USAF Academy trisonic wind tunnel. The wind tunnel was used as the cold flow simulation of the laser operating at Mach numbers of 3.5 and 4.5, and at test section static pressures of 0.5 to 0.8 torr, and a mock-up of one half of the laser duct was attached to the wind tunnel test section. Gas chromatograph analysis of the flow composition at several locations in the duct resulted in the determination of the proper helium purge gas mass flow out of the duct which was necessary to keep the duct free of laser gas. The necessary purge gas mass flow was found to be sufficiently low enough so as not to adversely affect the laser diffuser performance. A similarity parameter allows correlation to actual laser conditions. Author (GRA)

N75-15038# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
LASERS AND CHEMISTRY
A. Oraevskii 12 Sep. 1974 14 p Transl. into ENGLISH from Nauka i Zhizn (USSR), v. 31, no. 3, Mar. 1965 p 30-33
(AD-786910; FTD-HT-23-782-74) Avail: NTIS CSCL 07/5

The report briefly discusses the use at lasers in chemistry including laser enhanced reactions by selective excitation, and chemical lasers. GRA

N75-15039# Texas Univ., Dallas.
INVESTIGATION OF THE FEASIBILITY OF THE ELECTRON BEAM-EXCITED, HIGH PRESSURE RECOMBINATION LASER
Carl B. Collins and Austin J. Cunningham 1 Aug. 1974 79 p refs
(Contract N00015-67-A-0310-0007; ARPA Order 1807)
(AD-786738; UTDP-ML-01) Avail: NTIS CSCL 20/5

The first nitrogen ion laser pumped by charge transfer from He2(+) is reported in this work. Intense laser emission in the violet at 427 nm has been observed and found to have a linewidth less than 0.3 nm. The pumping ion, He2(+), was produced by discharge of a fast-pulsed electron beam gun into 7 atmospheres of a mixture of helium and nitrogen. Excitation current densities were 1.4 KA/sqcm at 1 MV over a 1 x 10 cm transverse geometry. Under these conditions, the efficiency of the emission of 427 .nm laser radiation was found to be 1.8% relative to the energy lost by the electron beam in the radiating volume. (Modified author abstract) GRA

N75-15040# Stanford Univ., Calif. Microwave Lab.
TUNABLE OPTICAL SOURCES Final Report, 1 Jul. 1972 - 30 Jun. 1974
Aug. 1974 21 p refs
(Grant DA-ARO(D)-31-124-72-G184; ARPA Order 675)
(AD-786775; SU-ML-2338; AROD-7580-20-P) Avail: NTIS CSCL 20/5

Work on this grant has been concerned with new techniques for the development of sources of tunable radiation and on techniques for spectral up-conversion of both incoherent and coherent infrared sources. Emphasis has been placed on the infrared region of the spectrum. Substantial progress has been made in the general areas of nonlinear optical materials, optical parametric oscillators, and nonlinear optical techniques in metal vapors and gases. Abstracts are given for all publications which have appeared or will appear under this grant. (Modified author abstract) GRA

N75-15041# Sperry Univac, St. Paul, Minn. Applied Research Dept.
WIDE ANGLE LASER BEAM STEERING
T. R. Johansen, F. G. Hewitt, L. J. Kochel, and E. J. Torok Jun. 1974 82 p refs
(Contract F33615-73-C-1009)
(AD-786848; AFAL-TR-74-183) Avail: NTIS CSCL 20/6

An investigation of wide angle laser beam steering by stripe domains in certain magnetic crystals has been conducted. Stripe domains were observed in bismuth substituted rare earth iron garnet crystals and MnBiSb crystals. The optical efficiency of diffraction by the bismuth substituted garnet was observed to be more than a factor of 20 greater than the efficiency of YIG crystals at 6328A. A laboratory steering device having a flat drive coil and a BiYbIG crystal with one side reflective coated produced steering through 350 mr(20 degrees) from the residual at a drive power of 37 watts. Improvement in the crystal element would reduce the drive power by perhaps a factor of 10. The influence of triaxial crystalline anisotropy in (111) crystals was calculated and the method of normal field correction is discussed. (Modified author abstract) GRA

N75-15042# ILC Technology, Inc., Sunnyvale, Calif.
PRODUCTION ENGINEERING MEASURE FOR OPTICAL PUMPS FOR LASERS Quarterly Report, Jan. - Mar. 1974
Robert Maynard and Hal Sowers Aug. 1974 31 p
(Contract DAAB05-73-C-2078)
(AD-787317; R-ILC-73-22/Q3; QR-3) Avail: NTIS CSCL 20/5

The program is directed towards establishing a capability for manufacturing flashlamps to be used as optical pumps in liquid cooled and gas cooled laser systems. This report describes the work carried out during the third quarter of the program. Testing was carried out on the fully developed liquid cooled lamps (Pump 1). Samples of a near optimal design of a gas cooled lamp (Pump 2) were fabricated and tested. First Engineering Test Samples (ETS) of Pump 1 Pump 2 have been submitted for evaluation. Modifications to the GFP unit designated for fluorescent analysis measurements were completed. Additional modifications have been made to the high speed data acquisition and recording system supplied by ILC. The ILC laser to be used for testing Pump 1 was evaluated for efficiency. A shock and

vibration fixture has been designed and completed for testing Pump 2. Engineering drawings for Pump 1 and Pump 2 have been completed. A production route sheet that is used in the manufacture of the lamps has been completed. Author (GRA)

N75-15043# Bendix Research Labs., Southfield, Mich.
FEASIBILITY STUDY OF EXOELECTRON IMAGING AS AN NDT METHOD FOR LASER SURFACE DAMAGE OF NONLINEAR OPTICAL MATERIALS AND LASER GLASS Final Report, 15 Aug. 1972 - 14 Feb. 1974
Peter F. Braunlich Aug. 1974 80 p refs
(Contract F19628-73-C-0032; AF Proj. 2042)
(AD-786450; BRL-7133; AFCRL-TR-74-0266) Avail: NTIS CSCL 20/5

The authors have investigated exoelectron emission from Nd-2 laser glass, lithium niobate, lithium fluoride, and sodium chloride. Exoelectron emission was measured either with channel electron multipliers and single-pulse counting techniques, or with the aid of channel plate multiplier bundles having high gain and spatial resolution. The work was performed to gain information on general exoelectron properties of optical materials particularly after exposure to intense laser pulses below and just above the damage threshold and to assess the feasibility of exoelectron techniques as NDT methods for laser surface damage. LiNbO3 exhibits a newly discovered effect subsequently termed thermally stimulated field emission of electrons. In general, laser-induced exoelectron emission was either not observed at all (as in Nd-2 glass and LiNbO3), found to be caused by unexpected plasma effects (as in LiF), or was too weak to be of any use as a NDT-technique. A phenomenological theory of the electron kinetic processes leading to electron trapping, exoelectron emission, and, ultimately, at very high photon fluxes, to intrinsic damage, was developed. (Modified author abstract) GRA

N75-15044# Army Missile Command, Redstone Arsenal, Ala.
MIXING GAS DYNAMIC LASERS
Thomas G. Roberts 1973 14 p refs
(AD-785667) Avail: NTIS CSCL 20/5

The paper reports the results obtained with an arc-driven gas dynamic laser (GDL) having an aerodynamic nozzle designed so that cold CO2 or other gases can be injected either into the expanding N2 flow before it reaches the nozzle exit (supersonic mixing mode) or into the flow just before it reaches the nozzle throat (near-sonic mixing mode). The gases can also be premixed either before or upon injection into the plenum (GDL mode). The results obtained in the GDL mode with marginal plenum conditions are compared with those obtained in the supersonic and near-sonic mixing modes using cold CO2. Preliminary results are also given for operation in the supersonic mixing mode when a mixture of cold CS2 and He is injected into the N2 flow. The laser is described first and then the results are presented and discussed. GRA

N75-15045# Army Electronics Command, Fort Monmouth, N.J.
DYNAMIC EFFECTS IN THERMAL BLOOMING IN HIGH POWER LASER PROPAGATION
Rudolf G. Buser and Robert S. Rohde 1973 16 p
(AD-785611) Avail: NTIS CSCL 20/5

An existing theory for pulse propagation is established, verified, and extended, such that optimized propagation conditions may be determined. An extensive experimental program was undertaken in order to provide guidance for a comprehensive theory, including collimated and focused Gaussian beam geometries. Phase 1, which deals with pulse durations longer than the acoustic transit time is completed. The results obtained and discussed indicate that the performance of collimated beams is adequately described by existing theory if thermal conduction is included; however, considerable departures are observed for focused beams. Author (GRA)

N75-15046# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CALCULATING THE TEMPERATURE FIELD OF MOLECULAR LASERS WITH GAS PUMPING
L. N. Orlov 17 Sep. 1974 15 p refs Transl. into ENGLISH from Zh. Prikl. Spektrosk. (USSR), v. 16, no. 3, Mar. 1972 p 437-442
(FTD Proj. T74-05-14)
(AD-787337; FTD-HC-23-1495-74) Avail: NTIS CSCL 20E

Significant successes have been achieved in developing molecular optical quantum generators by using continuously pumped gas through an active element--a discharge tube. The temperature of the gas is one of the most essential parameters in determining the efficiency and generation capacity. It is of interest to investigate the influence of gas pumping on the magnitude of heat evolution and the temperature distribution of the gas in the discharge tube of a molecular laser. For this purpose it is necessary to solve the problem of heat exchange with steady-state gas flow in a round tube with a given distribution of internal heat sources and limiting conditions of the first type. The investigation is limited to an examination of the laminar flow of a gas in a smooth cylindrical tube. GRA

N75-15047# United Aircraft Corp., East Hartford, Conn.
OPTICALLY PUMPED LASER Semiannual Technical Report, 1 Mar. - 15 Aug. 1974
Robert T. Brown 10 Oct. 1974 63 p refs
(Contract N00014-74-C-0376)
(AD-787497; UARL-N921853-2) Avail: NTIS CSCL 20/5

The report describes experimental and theoretical studies of a new technique for pumping high-pressure electric-discharge lasers. Diffuse discharges in mixtures of He/N2 and He/N2/Ar at electron densities in excess of 10 to the 15th power/cc and pressures of 15 atm were obtained. Calculations for a He/Xe mixture operating on the 1730A transition in molecular Xe show efficiencies for conversion from the 10.6 micrometer field into the UV radiation field in excess of 60%. Kinetic studies of the excimer energy transfer in He/Ar/N2 mixtures are described along with new pumping configurations which will allow operation with a UV optical cavity. Author (GRA)

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N75-15048 Michigan Univ., Ann Arbor.
VISCO-ELASTO-HYDRODYNAMICS (VEHD) OF SOFT POLYMERIC CONTACT(S) UNDER RIGID INDENTER(S) Ph.D. Thesis
Bitthal Das Gujrati 1974 371 p
Avail: Univ. Microfilms Order No. 74-25214

Tractional and lubrication performance of lubricated contact(s) between a rubber surface and rigid indenter(s) was studied. Conducted over a wide range of contact conditions (load, speed, etc.), such a study provides a better understanding of the mechanics of traction force generation between the tread-rubber and the road-stones at the tire-road interface. An evaluation of the contact frictional processes in lubricated rubber under a contactor reveals that all four friction mechanisms, namely, adhesion, tearing/abrasion, deformation loss in the rubber, and fluid film viscous shearing, are possible in a given situation. However, depending on contact conditions and the lubricant, the traction performance is dominated by one or more of these frictional processes. Under conditions of perfect lubricant-rubber wettability, friction was shown to consist simultaneously of deformation loss and fluid-film viscous drag. Dissert. Abstr.

N75-15049 + Engineering Sciences Data Unit, London (England).
EFFECT OF INCLINED NUT SEATINGS ON THE FATIGUE STRENGTH OF STEEL SCREW THREADS (TENTATIVE)
Mar. 1974 10 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-67034-Amend-A) Copyright. Avail: NTIS HC $12.00

A method of estimating the effect of an inclined nut seating on the fatigue strength of a steel screw thread is presented. The method is based on the calculation of an equivalent stress cycle which would produce the same endurance if the screw were axially loaded. The form of the relation between equivalent and nominal stresses is derived from an elastic theory. A summary of the experimental values used for the numerical analysis is included. An example of the procedure used for the numerical analysis is provided. Author

N75-15050* National Aeronautics and Space Administration. Pasadena Office, Calif.

COMBINED PRESSURE REGULATOR AND SHUTOFF VALVE Patent

Edgar F. Koch, inventor (to NASA) (JPL) Issued 24 Dec. 1974 5 p Filed 21 Jun. 1973 Supersedes N73-26474 (11 - 17, p 2036) Sponsored by NASA

(NASA-Case-NPO-13201-1; US-Patent-3,856,042; US-Patent-Appl-SN-372149; US-Patent-Class-137-505.42; US-Patent-Class-74-424.8VA; US-Patent-Class-137-505.38) Avail: US Patent Office CSCL 13K

A remotely operable pressure regulator and shutoff valve particularly suited for achieving high resolution and flow control, and positive shutoff is described. The valve is characterized by a spring-loaded ball coaxially aligned with a fluid port to be sealed, a spring-loaded pintle extended through the port into engagement with the ball, for controlling the position, a spring-loaded diaphragm for controlling the position of the pintle, and an axially displaceable spring supported by a movable stop which, in turn, is repositioned by a selectively operable stepper motor. Thus, the pressure-response characteristics for the valve can be varied through a selective repositioning of the stop.

Official Gazette of the U.S. Patent Office

N75-15051*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

METHANATOR FUELED ENGINES FOR POLLUTION CONTROL

D. E. Cagliostro and E. L. Winkler Mar. 1973 49 p refs (NASA-TM-X-62263; A-5833) Avail: NTIS HC $3.75 CSCL 21A

A methanator fueled Otto-cycle engine is compared with other methods proposed to control pollution due to automobile exhaust emissions. The comparison is made with respect to state of development, emission factors, capital cost, operational and maintenance costs, performance, operational limitations, and impact on the automotive industries. The methanator fueled Otto-cycle engine is projected to meet 1975 emission standards and operate at a lower relative total cost compared to the catalytic muffler system and to have low impact. Additional study is required for system development. Author

N75-15052*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DYNAMIC LOAD CAPACITIES OF GRAPHITE FIBER: POLYIMIDE COMPOSITES IN OSCILLATING PLAIN BEARINGS TO 340 C (650 F)

Harold E. Sliney, Thomas P. Jacobson, and Harold E. Munson (Marlin-Rockwell Corp.) Washington Jan. 1975 17 p refs (NASA-TN-D-7880; E-8118) Avail: NTIS HC $3.25 CSCL 13I

Load capacities were determined for plain spherical bearings with self-lubricating spherical elements of graphite-fiber-reinforced-polyimide, and for plain cylindrical bearings with thin-wall liners of the composite in the bearing bores. Composites consisted of a 1-to-1 weight ratio of graphite fibers and polyimide. Oscillation was at an amplitude of + or - 15 deg at a frequency of 1 hertz. Bearings with composite ball material had a load capacity of approximately 69 MN/sq m (10 000 psi) at room temperature 25 MN/sq m (3600 psi) at 340 C (650 F). Bearings with thin-wall composite liners had much higher load capacities of 280 MN/sq m (40 000 psi) at room temperature amd 240 MN/sq m (35 000 psi) at 320 C (600 F). Friction coefficients were in the range of 0.12 to 0.19. The addition of 10 wt.% graphite fluoride solid lubricant to the composition of the thin-wall liners reduced friction coefficients into the range of 0.10 to 0.12. Author

N75-15053*# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio.

PERFORMANCE OF 75-MILLIMETER-BORE BEARINGS USING ELECTRON-BEAM-WELDED HOLLOW BALLS WITH A DIAMETER RATIO OF 1.26

Harold H. Coe, Richard J. Parker, and Herbert W. Scibbe Washington Jan. 1975 20 p refs (NASA-TN-D-7869; E-7961) Avail: NTIS HC $3.25 CSCL 13I

An experimental investigation was performed to determine the rolling element fatigue life of electron beam-welded hollow balls with a diameter ratio (o.d./i.d.) of 1.26 and to determine the operating characteristics of bearings using these hollow balls. Similar bearings with solid balls were also tested and the data compared. The bearings were operated at shaft speeds up to 28,000 rpm with a thrust load of 2200 N (500 lb). Ball failures during the bearing tests were due to flexure fatigue. The solid and hollow ball bearings tested showed little difference in outer race temperatures and indicated the same bearing torque. The 17.5-mm (0.6875-in.) diameter balls were also tested in the five-ball fatigue tester and showed no significant difference in life when compared with the life of a solid ball. Author

N75-15054*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

BEARING ENDURANCE TESTS IN VACUUM FOR SPUTTERED MOLYBDENUM DISULFIDE FILMS

Toalivaldis Spalvins Washington Jan. 1975 11 p refs (NASA-TM-X-3193; E-8166) Avail: NTIS HC $3.25 CSCL 13I

Angular-contact, 440C stainless steel, ball bearings with sputtered MoS2 films 0.0000006 x 10-7m (6000 A) thick were evaluated in a vacuum bearing chamber (1750 rpm, 137.9-N-(31-lbf-) thrust load) for endurance. Two types of sputtered films were evaluated: (1) MOS2 sputtered directly onto bearing components, and (2) a thin 0.0000001 x 10-7m (1000 A) underlayer of Cr3Si2 subsequently sputtered with MoS2. Bearing test evaluations in vacuum showed that endurance lives of more than 1000 hours (105,000,000 cycles) were obtained with bearings (cage, races, and balls) directly sputtered with MoS2. The same endurance lives were also obtained when only the races and cage were sputtered with an underlayer of Cr3Si2 and subsequently with MoS2. Author

N75-15055*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

A METHOD AND A SYSTEM FOR EXTINGUISHING A FIRE WITHIN A SEALED BATTERY Patent Application

William J. Britz and William A. Boshers, inventors (to NASA) Filed 27 Dec. 1974 13 p

(NASA-Case-MFS-22952-1; US-Patent-Appl-SN-537025) Avail: NTIS HC $3.25 CSCL 13L

A method for extinguishing fires in electric batteries, particularly silver/zinc batteries, is described. The system consists of a vacuum manifold connected to the battery compartment and electrically actuated valves which operate in response to high temperatures. Opening the valve causes the combustion supporting gases to be evacuated from the battery housing and the fire is extinguished. The system may be used with ground support equipment as well as aboard spacecraft. NASA

N75-15056*# Systems Research Lab., Champaign, Ill.

RESEARCH STUDY ON STABILIZATION AND CONTROL: MODERN SAMPLED-DATA CONTROL THEORY. DESIGN OF THE LARGE SPACE TELESCOPE SYSTEM Final Report

B. C. Kuo and G. Singh 1 Jan. 1975 125 p

(Contract NAS8-29853)

(NASA-CR-120580) Avail: NTIS HC $5.25 CSCL 20K

Conditions of self-sustained oscillations in a two-axis model of the nonlinear LST system are studied. The describing function of the CMG frictional nonlinearity of the LST system is used for the analysis, as well as continuous-data and discrete-data models of the simplified LST control system. A numerical-iterative method is described for the analysis of the two-axis system. Approximation methods and the direct plotting of the stability equation are implemented in the study. It is shown that although the dynamics of the two axes are identical, the amplitudes of self-sustained oscillations in the two axes may in principle be different. Analysis shows that the LST systems are of equal amplitudes but with 180-degree phase shift. Author

N75-15057*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECT OF ADSORBED CHLORINE AND OXYGEN ON SHEAR STRENGTH OF IRON AND COPPER JUNCTIONS

Donald R. Wheeler Washington Jan. 1975 26 p refs (NASA-TN-D-7894; E-8122) Avail: NTIS HC $3.75 CSCL 20K

Static friction experiments were performed in ultrahigh vacuum at room temperature on copper, iron, and steel contacts selectively contaminated with oxygen and chlorine in submonolayer amounts. The concentration of the adsorbates was determined with Auger electron spectroscopy and was measured relative to the saturation concentration of oxygen on iron (concentration 1.0). The coefficient of static friction decreased with increasing adsorbate concentration. It was independent of the metal and the adsorbate. The results compared satisfactorily with an extension of the junction growth theory to heterogeneous interfaces. The reduction in interfacial shear strength was measured by the ratio sub a/sub m where sub a is the shear strength of the interface with an adsorbate concentration of 1.0, and sub m is the strength of the clean metal interface. This ratio was 0.835 + or - 0.012 for all the systems tested.
Author

N75-15058# Dow Chemical Co., Denver, Colo. Rocky Flats Div.
CHEMICAL MILLING OF BERYLLIUM FOR MACHINING DAMAGE REMOVAL
R. L. Riegel, E. L. Childs, and K. R. Souply 8 Jul. 1974 16 p refs
(Contract AT(29-1)-1106)
(RFP-2174) Avail: NTIS HC $3.25

A chemical milling process for removal of machining damage from beryllium was developed and implemented. Details are given of a chemical milling solution prepared especially for ingot-source beryllium to meet surface finish specifications. The solution is used in the production of both ingot-spurce and powder-spurce beryllium parts. Close dimensional tolerances and improved uniformity were achieved by using temperature control and by rotary fixturing. A new concept for fixturing was developed which utilizes the buoyancy of beryllium parts in the milling solution to position and rotate the parts during the chemical milling operation. Author (NSA)

N75-15059# Army Missile Command, Redstone Arsenal, Ala. Product Test and Failure Analysis Div.
TESTING OF CONFORMAL COATING BY USING A THERMOMECHANICAL TEST METHOD TO MEASURE THE GLASS TRANSITION Tg PROPERTY
Knowlen F. Knowles Jun. 1974 62 p refs
(AD-786525; QL-TR-74-1) Avail: NTIS CSCL 11/3

In the study a thermomechanical test method was used to measure the glass transition temperature of conformal coating materials. This physical property offered a quantitative measure of the thermal changes that occur in a conformal coating material after exposure to environmental conditions. The data obtained by this test method may be used as an aid in the quality evaluation of a conformal coating applied to printed wiring boards.
Author (GRA)

N75-15060# Naval Air Development Center, Warminster, Pa. Vehicle Technology Dept.
PARAMETRIC DESIGN AND ANALYSIS OF TARGET TOWLINES
D. Carroll 3 Sep. 1974 104 p
(AD-786695; NADC-74151-30) Avail: NTIS CSCL 13/9

The report collects, derives and defines the technical information which is applicable to detail design and analysis of target towlines. Parametric methods are developed for optimization of performance and towline length. The analytical methods which are presented are generally applicable whenever a tensile member is trailed from an airplane with a stabilizing or functioning device attached. Author (GRA)

N75-15061# Naval Air Propulsion Test Center, Trenton, N.J.
ROLLING CONTACT FATIGUE OF SILICON NITRIDE Final Report
Raymond Valori Aug. 1974 36 p refs
(AD-785854; NAPTC-PE-42) Avail: NTIS CSCL 13/9

Rolling contact fatigue studies were conducted comparing hot-pressed silicon nitride and consumable vacuum melted M-50 steel. Test results showed that: (a) Silicon nitride is superior to M-50 steel by at least an order of magnitude. (b) Surface finishing process significantly effects the fatigue life of silicon nitride. (c) Silicon nitride run in contact with M-50 steel may have a detrimental effect on the fatigue life of M-50 steel. (d) Skidding may be detrimental to the surface durability of silicon nitride. Author (GRA)

N75-15062# Dallas Transit System, Tex.
ORGANIC RANKINE CYCLE PROPULSION SYSTEM FOR USE ON A 25-PASSENGER BUS Final Report
E. H. Watkins Jun. 1974 179 p refs Sponsored by Urban Mass Transportation Admin.
(PB-234793/8; UMTA-TX-06-0004-74-1) Avail: NTIS HC $7.00 CSCL 21A

The objective of the program was to determine the feasibility and access the pollution reduction value of installing and operating an organic Rankine cycle propulsion system in a 25-passenger bus. The study consisted of system definition, fabrication, systems integration, installation and operational checkout of the Rankine Cycle (ORC) propulsion system consisting of burner heater, turbine engine, regenerator, and condenser. The transit bus used was Twin Coach, model TC-25, manufactured by Highway Products, Inc. Kent, OH. This phase successfully demonstrated the feasibility of installing and operating an ORC engine in an urban bus. Results indicate that the bus meets the Heavy Duty Diesel emission limits. (Modified author abstract) GRA

N75-15367 Academy of Sciences (USSR), Moscow.
ADAPTIVE TEMPERATURE CONTROL OF THE POLYMERIZATION PROCESS IN THE SYNTHETIC RUBBER PRODUCTION
G. S. Aksenov, V. M. Breytman, A. V. Zak, B. D. Lyubachevskiy, G. D. Penev, B. A. Perlin, and V. A. Yakubovich *In its* Probl. of Cybernetics 1974 p 196-202 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

N75-15374 Academy of Sciences (USSR), Mcscow.
STRUCTURE OF AN ADAPTIVE SYSTEM FOR MILLING OPTIMIZATION
Ya. G. Goldin, V. V. Dronov, Yu. A. Polyakov, and I. B. Rubashkin *In its* Probl. of Cybernetics 1974 p 231-234 ref In RUSSIAN (For availability see N75-15338 06-63)
Copyright:

N75-15375 Academy of Sciences (USSR), Moscow.
STABILITY OF ONE TYPE OF ADAPTIVE SYSTEM OF MILLING MACHINE CONTROL
I. B. Rubashkin, Ya. G. Goldin, and A. N. Grin *In its* Probl. of Cybernetics 1974 p 235-239 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

N75-15378 Academy of Sciences (USSR), Moscow.
AN ADAPTIVE SYSTEM FOR OPTIMAL CONTROL OF STATIC OBJECTS WITH LIMITATIONS ON THE OUTPUT COORDINATES AND ON CONTROL
D. P. Derevitskiy, N. F. Rubekin, V. I. Robin, and V. P. Shafranov *In its* Probl. of Cybernetics 1974 p 248-253 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N75-15063# Laboratorio de Acustica e Sonica, Sao Paulo (Brazil).
ULTRASONIC INSPECTION AND CONTROL OF ALUMINUM
L. X. Nepomuceno, L. C. Giannini, and G. Molina 25 Jun. 1974 9 p In PORTUGUESE; ENGLISH summary
(TR-7406.717) Avail: NTIS HC $3.25

The report describes the inspection carried out for the ultrasonic control and maintenance of aluminum extrustion press tie rods, indicating the equipment, accessories and procedure.

The results are presented in schematic drawings, with defect positioning, accompanied of photos of the observed echograms. Author

N75-15064*# Martin Marietta Corp., Denver, Colo. Space Systems Dynamics.
TRACK/TRAIN DYNAMICS TEST PROCEDURE TRANSFER FUNCTION TEST
R. A. Vigil 6 Jan. 1975 23 p
(Contract NAS8-29882)
(NASA-CR-120590; TP-005-TF) Avail: NTIS HC $3.25 CSCL 13F

A transfer function vibration test was made on an 80 ton open hopper freight car in an effort to obtain validation data on the car's nonlinear elastic model. Test configuration, handling, test facilities, test operations, and data acquisition/reduction activities necessary to meet the conditions of test requirements are given. Author

N75-15065*# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
SPACEFLIGHT TRACKING AND DATA NETWORK OPERATIONAL RELIABILITY ASSESSMENT FOR SKYLAB
V. I. Seneca and R. H. Mlynarczyk Apr. 1974 81 p refs
(NASA Order S-70130G; Contract N00017-72-C-4401)
(NASA-CR-139174; CSC-1-395) Avail: NTIS HC $4.75 CSCL 14D

Data on the spaceflight communications equipment status during the Skylab mission were subjected to an operational reliability assessment. Reliability models were revised to reflect pertinent equipment changes accomplished prior to the beginning of the Skylab missions. Appropriate adjustments were made to fit the data to the models. The availabilities are based on the failure events resulting in the stations inability to support a function of functions and the MTBF's are based on all events including 'can support' and 'cannot support'. Data were received from eleven land-based stations and one ship. Author

N75-15066*# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
SPACEFLIGHT TRACKING AND DATA NETWORK OPERATIONAL RELIABILITY COMPUTER OUTPUT FOR MTBF AND AVAILABILITY. APPENDIX V TO CSC-1-395
V. I. Seneca and R. H. Mlynarczyk Apr. 1974 87 p
(NASA Order S-70130G; Contract N00017-72-C-4401)
(NASA-CR-139175; CSC-1-395-A) Avail: NTIS HC $4.75 CSCL 14D

Tables of data are provided to show the availability of Skylab data to selected ground stations during the phases of Skylab preflight, Skylab unmanned condition, and Skylab manned condition. The mean time between failure (MTBF) of the same Skylab functions is tabulated for the selected ground stations. All reliability data are based on a 90 percent confidence interval. Author

N75-15067# Sandia Labs., Albuquerque, N.Mex.
MANUAL FOR USE, INSPECTION, AND MAINTENANCE OF HOISTING EQUIPMENT
L. Stinnett Jul. 1974 33 p refs
(Contract AT(29-1)-789)
(SLA-74-0206) Avail: NTIS HC $3.75

Guidance for operational use, mechanical and electrical inspection, and maintenance of hoisting equipment at Sandia Laboratories is provided. Hoisting equipment includes cranes, bridges, trolleys, monorails, gantries, jibs, winches, and lifts. Responsibilities for inspection, servicing, testing, reviewing, and record keeping are assigned. Author

N75-15068# Army Materiel Systems Analysis Agency, Aberdeen Proving Ground, Md.
TRACKING RELIABILITY GROWTH
Larry H. Crow 1974 15 p refs
(AD-785614) Avail: NTIS CSCL 14/4

Contents: The Weibull reliability growth model; Estimation and goodness of fit procedures; Confidence bounds for MTBF; Numerical example; Application. GRA

N75-15069# Naval Civil Engineering Lab., Port Hueneme, Calif.
REINFORCED PLASTICS LAMINATES PANELS. PHYSICAL TESTS AND SURFACE EXAMINATION OF PANELS REMOVED AFTER FIVE YEARS OF EXPOSURE Final Report, Jul. 1965 - Dec. 1970
Thorndyke Roe, Jr. and Robert L. Alumbaugh Sep. 1974 59 p
(YF51543004)
(AD-786349; CEL-TN-1352) Avail: NTIS CSCL 11/4

Sets of coated and uncoated glass-reinforced epoxy and thermosetting polyester laminate panels have been exposed to the atmosphere at Port Hueneme and China Lake, California, and at Kwajalein, Marshall Islands. A fourth set was maintained at CEL as a control. Results of physical tests performed on the panels exposed at the three field locations for all periods up to five years, and the results from the same tests on the control panels are reported. Comparisons of the mean and standard deviations of the tensile strength, compressive strength, flexural strength, and flexural modulus of elasticity are presented. Also, panels exposed at the three sites for five years together with the control panels stored for that length of time were examined visually; their surface condition is reported. Weather data from the test sites for the entire test period are presented. (Modified author abstract) GRA

N75-15070# Air Force Avionics Lab., Wright-Patterson AFB, Ohio.
TESTING AND ENVIRONMENTAL SIMULATION OF RECONNAISSANCE SYSTEMS
Roland D. Mower Jul. 1974 45 p refs
(AD-786881; AFAL-TR-74-204) Avail: NTIS CSCL 15/4

The report consists of a series of eight papers presented at the National Aerospace and Electronics Conference (NAECON 74) held in Dayton, OH, 13-15 May 1974. These papers describe various philosophic concepts and techniques employed by members of the Dynamic Analyzer Complex (AFAL/RSE) in the accomplishment of their mission, which involves dynamic and environmental test evaluations and analyses of reconnaissance systems and their components. Author (GRA)

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N75-15071 Polish Academy of Sciences, Warsaw.
ANALYTICAL MECHANICS OF HOMOGENOUS DEFORMATIONS [MECHANIKA ANALITYCZNA DEFORMACJI JEDNORODNYCH]
Jan J. Slawianowski 1973 39 p refs In POLISH
(Rept-8/1973) Avail: Issuing Activity

It was shown that the classical methods of analytical, Hamiltonian mechanics provide a framework for studying finite homogeneous strains. The geometric structure of the configuration space in a homogeneously deformed body was investigated along with kinematical symmetries, and the nonholonomic velocities related to them. The phase space of a deformable body was also constructed and studied. The kinetic energy of a homogeneously deformable medium was calculated and expressed in terms of the strain parameters in two versions: (1) assuming in one that the physical space has some Euclidean metric, and (2) assuming that the amorphous space has no metrical concepts. Methods are presented for describing interactions, stresses, and volume-forces. Author

N75-15072 Polish Academy of Sciences, Warsaw.
APPLICATION OF THE PROPERTY OF RESONANT CIRCULAR PLATES TO THE DETERMINATION OF THE ELASTICITY CONSTANTS [ZASTOSOWANIE WLASCIWOSCI REZONANSOWYCH PLYT KOLOWYCH DO WYZNACZANIA STALYCH SPREZYSTOSCI]
Jan Ryll-Nardzewski 1973 203 p refs In POLISH
(Rept-44/1973) Avail: Issuing Activity

Elasticity constants of solid bodies were determined, and measurement methods and systems, resonance methods in particular, are presented. The elastic vibrations of thick circular plates and their relationship to the measurement of elasticity constants were investigated. It was found that the measurements are influenced by the shape of the samples, the surrounding media, and the presence of anisotropy. Transl. by M.J.S.

N75-15073*# Carnegie Inst. of Tech., Pittsburgh, Pa. Dept. of Mechanical Engineering.
DEVELOPMENT OF THE PROGRAM SPECEL: A SPECIAL ELEMENT FOR ELASTO-PLASTIC CRACK TIP ANALYSIS
J. L. Swedlow Dec. 1974 32 p refs
(Grant NGR-39-087-053)
(NASA-CR-140895; SM-74-10) Avail: NTIS HC $3.75 CSCL 20K

Theory is stated in terms of increments of displacement and stress, and of instantaneous or accumulated values of stress. The equilibrium equations, in the absence of body forces, are written, along with constitutive relations for plane strain. Author

N75-15074*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SOLUTION OF ELASTOPLASTIC TORSION PROBLEM BY BOUNDARY INTEGRAL METHOD
Alexander Mendelson Washington Jan. 1975 20 p refs
(NASA-TN-D-7872; E-8108) Avail: NTIS HC $3.25 CSCL 20K

The boundary integral method was applied to the elastoplastic analysis of the torsion of prismatic bars, and the results are compared with those obtained by the finite difference method. Although fewer unknowns were used, very good accuracy was obtained with the boundary integral method. Both simply and multiply connected bodies can be handled with equal ease. Author

N75-15075*# George Washington Univ., Washington, D.C. School of Engineering and Applied Science.
A STUDY OF THE EFFECT OF ADHESIVE AND MATRIX STIFFNESSES ON THE AXIAL, NORMAL, AND SHEAR STRESS DISTRIBUTIONS OF A BORON-EPOXY REINFORCED COMPOSITE JOINT M.S. Thesis
William Edward Howell Dec. 1974 49 p refs Sponsored by NASA
(NASA-CR-141311) Avail: NTIS HC $3.75 CSCL 20K

The mechanical properties of a symmetrical, eight-step, titanium-boron-epoxy joint are discussed. A study of the effect of adhesive and matrix stiffnesses on the axial, normal, and shear stress distributions was made using the finite element method. The NASA Structural Analysis Program (NASTRAN) was used for the analysis. The elastic modulus of the adhesive was varied from 345 MPa to 3100 MPa with the nominal value of 1030 MPa as a standard. The nominal values were used to analyze the stability of the joint. The elastic moduli were varied to determine their effect on the stresses in the joint. Author

N75-15076# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
SEQUENCE EFFECTS IN TWO-LEVEL AND MULTILEVEL FATIGUE TESTS OF NOTCHED AND UNNOTCHED SPECIMENS
Alfred Buch Nov. 1974 65 p refs
(TAE-231) Avail: NTIS HC $4.25

Tests were performed on aluminium alloy and on carbon steel specimens with the aim to investigate the effect of various sequences on the cycle ratio sum. Effects analyzed included these due to the loading sequence in the first block and at the last stress-level change, to a small number of high stress amplitude, and the sign of the transition half-cycle. Results for H-L, L-H, and block loading sequences were compared. Henery's damage cumulation rule was used for theoretical analysis of the sequence effects in case of rotating-bending and tension-compression block spectrum test of various types. The normal effect was observed in two-step rotating-bending and tension-compression tests and may be described by nonlinear stress-dependent damage cumulation. The reversed effect was observed in two-step pulsating tension tests and may be related to the influence of residual compressive stresses and to the cyclical hardening. Author

N75-15077*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BORON/ALUMINUM GRAPHITE/RESIN ADVANCED FIBER COMPOSITE HYBRIDS
Christos C. Chamis, Raymond F. Lark, and Timothy L. Sullivan Washington Feb. 1975 26 p refs
(NASA-TN-D-7879; E-8030) Avail: NTIS HC $3.75 CSCL 11D

Fabrication feasibility and potential of an adhesively bonded metal and resin matrix fiber-composite hybrid are determined as an advanced material for aerospace and other structural applications. The results show that using this hybrid concept makes possible a composite design which, when compared with nonhybrid composites, has greater transverse strength, transverse stiffness, and impact resistance with only a small penalty on density and longitudinal properties. The results also show that laminate theory is suitable for predicting the structural response of such hybrids. The sequence of fracture modes indicates that these types of hybrids can be readily designed to meet fail-safe requirements. Author

N75-15078# Aerojet Nuclear Co., Idaho Falls, Idaho.
EFFECTS OF NEUTRON RADIATION ON THE FATIGUE AND CREEP/FATIGUE BEHAVIOR OF TYPE 308 STAINLESS STEEL WELD METAL AT ELEVATED TEMPERATURES
G. E. Korth and M. D. Harper 1974 16 p refs Presented at the Symp. on the Effects of Radiation on Structural Mater., Gatlinburg, Tenn., 11-13 Jun. 1974
(Contract AT(10-1)-1375)
(Conf-740651-3) Avail: NTIS HC $3.25

Results from elevated-temperature, strain-controlled fatigue tests with and without hold periods at peak strain on specimens cut from Type 304 stainless steel plates welded using Type 308 stainless weld wire with controlled residual elements are reported. Irradiation reduced the fatigue life of the weld metal at 593 C by about one-half in the low cycle region, but cyclic life was equivalent or slightly superior to the unirradiated material in the higher cycle region. At 482 C and at the lower fluence, the fatigue behavior of the irradiated specimens was about equivalent in the low cycle region and superior in the high cycle region. Introducing tensile hold periods at the peak strain of each fatigue cycle of the 593 C tests resulted in reductions in the fatigue life but at a much lesser rate than the base (parent) metal. Irradiation further reduced the life of the hold time tests. Hold periods had no significant effect at 482 C. Orientation effects were seen in all weld metal tests with the parallel orientation showing a superiority in cyclic life over those taken transverse to the welding direction. Author (NSA)

N75-15079# Manlabs, Inc., Cambridge, Mass.
NOISE ABATEMENT AND INTERNAL VIBRATIONAL ABSORPTION IN POTENTIAL STRUCTURAL MATERIALS Semiannual Report, 1 Dec. 1973 - 1 Jun. 1974
S. A. Kulin, L. Kaufman, and P. P. Neshe Aug. 1974 46 p refs
(Grant DAAG46-74-C-0048; ARPA Order 2555)
(AD-785595; AMMRC-CTR-74-53) Avail: NTIS CSCL 13/3

The damping capacity of NiTi, Cu-Al-Ni and Fe-Pt alloys is being studied as a function of temperature above and below Ms. Measurements of heat capacity and transformation characteristics have been completed for NiTi and one Fe-Pt alloy and are in progress for a second Fe-Pt alloy and the Cu-Al-Ni alloy. Mechanical property measurements and assessment of the effects of elastic and plastic strains on the characteristics of the Ni-Ti alloy are in progress. The transformation in NiTi alloys is thermoelastic. A plastic deformation can be employed to alter the transformation characteristics. (Modified author abstract) GRA

N75-15080# Brown Univ., Providence, R.I. Dept. of Engineering.
APPROXIMATION TECHNIQUES FOR IMPULSIVE LOADING OF STRUCTURES OF TIME DEPENDENT PLASTIC BEHAVIOR WITH FINITE DEFLECTIONS
P. S. Symonds and C. T. Chon Mar. 1974 52 p refs
(Contract N00014-67-A-0191-0003)
(AD-786241; TR-23) Avail: NTIS CSCL 13/3

Methods for estimating plastic deflections of impulsively

loaded structures are described with emphasis on methods for rate dependent behavior which can be extended to problems of finite deflections. Two approaches are described, namely deflection bounds and the mode approximation technique. A constitutive law of homogeneous viscous type is used since this simplifies both approaches and is conservative. The authors illustrate fitting this representation to test data for mild steel and titanium alloys. A discrete two-mass model is used to illustrate the basic ideas. Author (GRA)

N75-15081# California Univ., Berkeley. Structural Engineering Lab.
NONLINEAR FINITE ELEMENT DYNAMIC ANALYSIS OF AXISYMMETRIC SOLIDS Interim Report, Jul. 1973 - Jul. 1974
S. Nagarajan and E. P. Popov Jul. 1974 55 p refs
(Contract DAAA21-72-C-0727)
(AD-785734; UCSESM-74-9) Avail: NTIS CSCL 20/11

The subject of this investigation has been the static and dynamic analysis of axisymmetric solids taking into account both material and geometric nonlinearities. A general Lagrangian formulation forms the basis for the incremental equations of motion which are solved using direct integration methods. Solution accuracy is improved by applying equilibrium correction loads at each step. Finite element discretization is achieved through the use of quadrilateral plane stress and axisymmetric elements with incompatible modes added for improvement of the element flexural characteristics. Several numerical examples are presented to demonstrate the effectiveness of the developed computer program. Author (GRA)

N75-15082# Watervliet Arsenal, N.Y.
ELASTIC-PLASTIC SOLUTION OF A TWO-DIMENSIONAL TUBE PROBLEM BY THE FINITE ELEMENT METHOD
Peter C. T. Chen Sep. 1974 29 p refs
(DA Proj. 1E6-62708-A-090)
(AD-786532; WVT-TR-74038) Avail: NTIS CSCL 19/6

The incremental tangent-modulus approach of the finite element formulation together with the computer program has been developed for the two dimensional problem of thick-walled tubes subjected to axisymmetric loadings. The material model is elastic-plastic strain hardening, obeying the Mises yield criterion and the Prandtl-Reuss flow theory. The illustrative example is an open-end gun tube loaded by a band of internal pressure. Both the hardening and non-hardening tubes under uniform and non-uniform loadings have been considered. The numerical results of the stresses and displacement are presented only for the non-hardening tube under uniform loading condition.
Author (GRA)

N75-15083# Watervliet Arsenal, N.Y.
THE FINITE ELEMENT ANALYSIS OF ELASTIC-PLASTIC THICK-WALLED TUBES
Peter C. T. Chen Sep. 1974 34 p refs
(DA Proj. 1E6-62708-A-090)
(AD-786533; WVT-TR-74039) Avail: NTIS CSCL 19/6

The incremental tangent-modulus approach of the finite element formulation together with the computer programming has been developed for the generalized plane-strain problem of the thick-walled tubes subjected to internal pressure, external pressure and end force. The material model is elastic-plastic strain-hardening, obeying the Mises yield criterion and the Prandtl-Reuss flow theory. Numerical results for the stresses and strains in the case of internal pressure only have been obtained for a linear hardening tube under all three end conditions. Comparisons with other solutions in the elastic-perfectly-plastic case have been given. (Modified author abstract) GRA

N75-15084# Army Foreign Science and Technology Center, Charlottesville, Va.
EVALUATION OF THE EFFECTS OF RESIDUAL STRESSES ON THE BRITTLE STRENGTH OF WELDED CONSTRUCTIONS WITH SURFACE DEFECTS
G. P. Cherepanov, A. B. Kaplun, and L. P. Karasev 3 Nov. 1973 13 p refs Transl. into ENGLISH from Probl. Prochnostiv Mashinostr., Akad. Nauk SSSR Inst. Mashinoved. (Moscow), no. 12, 1971 p 30-35
(AD-785946; FSTC-HT-23-1380-73) Avail: NTIS CSCL 20/11

The authors derive equations which can be used to estimate the strength of cylindrical shells, taking into account their geometric parameters, residual stresses, the sizes of cracks in the metal and the breakdown toughness. GRA

N75-15085# Army Materials and Mechanics Research Center, Watertown, Mass.
HIGH DAMPING MATERIALS, FUNDAMENTAL ASPECTS
Richard J. Weiss and Kenneth Tauer 1974 8 p
(AD-785695) Avail: NTIS CSCL 11/6

Any theoretical treatment of anharmonicity and soft modes in real crystals is prodigious so it is useful to examine a very simple system just to see how anharmonicity couples normal modes together and affects certain physical properties. The system chosen is that of the one-dimensional coupled oscillators each of identical mass M coupled between two rigid (or non-rigid) walls by three identical springs. Mathematical expressions are provided and the thermodynamic relationships are expressed in this report. Steel and Nitinol are used for examples. GRA

N75-15086# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INVESTIGATION OF THE REACTION OF A SPHERICAL SHELL TO POWER AND THERMAL SHOCK
Yu. G. Korotkikh and Ay. I. Ruzanov 16 Sep. 1974 18 p refs Transl. into ENGLISH from Uch. Zap. Gorkovsk. Gos. Univ. (Gorki), no. 134, 1971 p 91-102
(AD-785993; FTD-MT-24-1602-74) Avail: NTIS CSCL 20/11

The report is devoted to the analysis of processes, which occur in a spherical aluminum shell during two types of dynamic effects: the power pulse effect and the thermal effect. GRA

N75-15087# Army Materials and Mechanics Research Center, Watertown, Mass.
STRESS ANALYSIS OF STRUCTURAL JOINTS AND INTERFACES: A SELECTIVE ANNOTATED BIBLIOGRAPHY
Margaret M. Murphy and Edward M. Lende Sep. 1974 65 p
(AD-786520; AMMRC-MS-74-10) Avail: NTIS CSCL 13/5

An annotated bibliography is presented of the work reported in the literature (1968-1974) on the stress analysis of structural joints and interfaces. In addition to work on structural joints, bonded joints, welded joints, and fasteners, work on the stress analysis of flawed and unflawed layered media of dissimilar isotropic and anisotropic materials is also included.
Author (GRA)

N75-15088# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
STRESS INTENSITY FACTORS FOR SOME THRU-CRACKED FASTENER HOLES
Alten F. Grandt, Jr. Jul. 1974 31 p refs
(AF Proj. 7351)
(AD-786027; AFML-TR-74-71) Avail: NTIS CSCL 13/5

A stress intensity factor solution is developed for a large plate containing radial hole cracks loaded with arbitrary crack face pressure. When the pressure is defined as the unflawed hoop stress surrounding a mechanical fastener, stress intensity factor calibrations are readily computed by the linear superposition principle. Results obtained in this manner agree well with previous solutions determined for open holes loaded in remote tension. The potential usefulness of the present analysis is further demonstrated with application to specific fastener configurations, including interference fit fasteners, pin-loaded plates, and cold-worked holes. Author (GRA)

N75-15089# George Washington Univ., Washington, D.C. Inst. for Management Science and Engineering.
OPTIMAL STRUCTURAL DESIGN AND THE GENERAL EIGENPROBLEM
James E. Falk, Anthony V. Fiacco, and Garth P. McCormick 30 Jun. 1974 33 p refs
(Contract DAHC04-74-C-0002)
(AD-786713; Serial-T-302; AROD-11559-3-M) Avail: NTIS CSCL 20/11

This report summarizes findings in developing a procedure for solving a class of optimal structural design nonlinear

programming problems which require the calculation of the minimum eigenvalue of a general eigenproblem to evaluate certain constraints. Eigenproblem solution methods tested were the power method, a conjugate gradient method and a (complete solution) method based on deriving the involved stiffness matrices as sums of outer products of vectors and exploiting this decomposition in an iterative technique. Drawbacks of the various techniques are indicated and an unsuccessful attempt to use a well-known nonlinear programming algorithm (SUMT) in conjunction with the power method is described. Obstacles to efficient procedures are indicated. Author (GRA)

N75-15090# Watervliet Arsenal, N.Y.
THE RELATIVE OPTIMIZATION OF HAUGER'S PROBLEM WITH BOTH INTERNAL AND EXTERNAL DAMPING
Charles R. Thomas Jul. 1974 48 p refs
(DA Proj. 1F1-61102-A-35D)
(AD-786529; WVT-TR-74025) Avail: NTIS CSCL 20/11

The relative mass optimization of a nonconservatively loaded cantilever beam with internal and external damping is discussed with numerical results given for a beam with a linear distributed tangential load acting along the center line of the beam. In going to a Rosenbrock optimization routine with a minimum tip thickness constraint imposed, it was quite clear that mass ratio reductions in the range 14.9% to 38% are possible and that the values of internal and external damping appear influential in determining just how much of a mass reduction is possible. Author (GRA)

N75-15091# Washington Univ., Seattle. Dept. of Mechanical Engineering.
STRESS INTENSITY FACTOR OF A CORNER CRACK Interim Technical Report
Albert S. Kobayashi Aug. 1974 31 p refs
(Grant DA-ARO(D)-124-73-G38)
(AD-786701; AROD-10100-3-E; ITR-3) Avail: NTIS CSCL 20/11

The alternating method for elliptical flaw analysis has been extended to solve corner flaw (and surface flaw) problems by prescribing appropriate fictitious pressure on the elliptical crack surface which protrudes into the free space. This procedure accelerates the numerical convergence of the iteration process and extends the applicability of the third order polynomial of pressure distribution. The improved alternating procedure is then used to determine stress intensity factors in corner flaws with aspect ratios of a/b equal to 0.98, 0.4 and 0.2 and subjected to uniform or linearly varying pressure distributions. Author (GRA)

N75-15092# Sydney Univ. (Australia). Civil Engineering Labs.
THE ECONOMICAL SOLUTION OF ELASTIC PROBLEMS FOR A RANGE OF POISSONS RATIO
J. R. Booker and J. C. Small Feb. 1974 15 p refs
(PB-234804/3; R-238) Avail: NTIS HC $3.25 CSCL 13M

An economical method for calculating the stress and displacement fields in an elastic body for a range of Poisson's ratios is given. The solution is expanded as a power series in Poisson's ratio, the coefficients of the series being determined successively. The range of convergence of the solution is examined, and it is shown that the power series converges for values of Poisson's ratio in the range zero to a half, provided a suitable point of expansion is chosen. A particular feature of the method is that it requires no special formulation or care to evaluate the solution for an incompressible material when Poisson's ratio is a half. GRA

N75-15093# Sydney Univ. (Australia). Civil Engineering Labs.
FLEXURAL-TORSIONAL BUCKLING OF CURVED MEMBERS
P. Vacharajittiphan and N. S. Trahair Jan. 1974 38 p refs
(PB-235063/5; R-232) Avail: NTIS HC $3.75 CSCL 13M

A method of analysing the elastic flexural-torsional buckling of plane curved I-section members is developed. The solutions of the inplane bending equation are substituted into the out-of-plane buckling equations which become linearized. These buckling equations, which contain the bending and torsion differential equations and the boundary and warping equations, are solved numerically by the method of finite integrals, and the critical load is obtained iteratively. GRA

N75-15094# Transport and Road Research Lab., Crowthorne (England). Structures Dept.
AN INVESTIGATION INTO THE FATIGUE OF WELDS IN AN EXPERIMENTAL ORTHOTROPIC BRIDGE DECK PANEL
D. E. Nunn 1974 48 p
(PB-234720/1; TRRL-LR-629) Avail: NTIS HC $3.75 CSCL 13E

After four years of normal trafficking, cracking occurred in welded connections on an experimental orthotropic bridge deck panel. These connections were fillet welds between the trapezoidal stiffeners and the cross-beam, the stiffeners being fitted between cross-beams. Initial investigations showed that the cracking was due to fatigue of the weld metal accelerated by factors attributed to the poor standard of fabrication of the deck panel. Further investigation was required to establish the performance under traffic loading because this stiffener design is typical of that used in bridge deck construction. Tests confirmed that the design of this type of stiffener to cross-beam connection must be assessed for fatigue under traffic loading. GRA

N75-15095# Cranfield Inst. of Technology (England). Dept. of Aircraft Design.
OPTIMUM DESIGN OF THIN WALLED STRUCTURES Final Report, 1 Jun. 1972 - 31 May 1973
D. M. Richards and A. Rothwell 9 Sep. 1974 6 p refs
(Grant AF-AFOSR-2390-72; AF Proj. 9767)
(AD-787223; CODP-11; EOARD-TR-75-9) Avail: NTIS CSCL 01/3

The research program relating to the optimum design of thin walled structures is a broadly based effort which reflects the continuing interest of the Aircraft Design Division in fundamental aspects of the analysis and design of highly efficient structures for aero-space applications. Topics briefly discussed include the following: Post-buckled design, design of shear webs; foam stabilized plates; compression panel design including plasticity effects. GRA

42 GEOSCIENCES (GENERAL)

N75-15096# Technische Universitaet, Brunswick (West Germany).
GEOPHYSICAL STUDIES AND REPORTS ON METEOROLOGY AND ASTROPHYSICS: A SIMPLE HYDRODYNAMIC MODEL FOR EXPLAINING THE NORTHERN GERMANY SALT STRUCTURES Ph.D. Thesis [GEOPHYSIKALISCHE ARBEITEN SOWIE MITTEILUNGEN AUS METEOROLOGIE UND ASTROPHYSIK: VERSUCH DER ERKLAERUNG NORDDEUTSCHER SALZSTRUKTUREN MIT EINEM EINFACHEN HYDRODYNAMISCHEM MODELL]
Hildegard Saalfrank 1973 80 p refs In GERMAN
Avail: NTIS HC $4.75

A linearized Navier-Stokes equation is used to analyze the salt dome problem in a two layer model having constant densities, equivalent viscosities, and finite layer compaction. The analytical solution provides insight into parametric effects on salt dome dimension and the dominant wavelength for intrusive distribution in the instable system sediment-salt. Transl. by G.G.

N75-15097*# Kanner (Leo) Associates, Redwood City, Calif.
PRELIMINARY DATA ON THE UHF RADIOMETRIC RESEARCH OF SOIL WETNESS, CONDUCTED IN THE USSR, IN 1974
A. Ye. Basharinov, L. F. Borodin, G. I. Chukhray, and A. M. Shutko Washington NASA Jan. 1975 15 p Transl. into ENGLISH of "Predvaritel'nyye materialy SVCH radiometricheskikh issledovaniy vlazhnosti pochv. provedennykh v SSSR v techeniye 1974 g" report, (Moscow), Acad. of Sci. USSR, 1975 15 p
(Contract NASw-2481)
(NASA-TT-F-16151) Avail: NTIS HC $3.25 CSCL 08M

Aircraft studies of the radiation characteristics of moist soils were performed in several regions of the U.S.S.R.. Radiometers installed on board an IL-14 aircraft were used for obtaining radiation measurements. The characteristics of the regions and their agricultural-meteorological conditions during these measurements are presented along with surface measurements and photographs. Data tables explaining the measurement results are included. M.J.S.

N75-15098# Geological Survey, Menlo Park, Calif. Water Resources Div.
SPECIAL TECHNIQUES FOR DETERMINING CHEMICAL PROPERTIES OF GEOTHERMAL WATER
T. S. Presser and Ivan Barnes Aug. 1974 16 p refs
(PB-235148/4; USGS-WRI-22-74; USGS/WRD-74-028) Avail: NTIS HC $3.25 CSCL 07D

A reliable determination of the chemical composition of geothermal fluids may require special sampling and preservation techniques. A sample collected without pretreatment is usually adequate for the analysis of sodium, potassium, and chloride. Other constituents may require further treatment or even analysis in the field, depending on the data requirements. The collection and preservation methods described permit accurate results for 31 chemical variables, including major and minor chemical consitutents. GRA

N75-15099# Bureau of Mines, Denver, Colo. Mining Research Center.
IMPROVED ELECTRICAL RESISTIVITY FIELD SYSTEM FOR SHALLOW EARTH MEASUREMENTS
C. Melvin Lepper and James H. Scott Jul. 1974 25 p refs
(PB-234694/8; BM-RI-7942) Avail: NTIS HC $3.25 CSCL 08I

The Bureau of Mines has developed an improved earth resistivity field system which employs a technique for obtaining null measurements. The instrument is designed to operate reliably in high noise environments such as those found in the vicinity of operating mines. The system consists of a low frequency transmitter, a sensitive receiver, and an external battery pack. The receiver and transmitter units have self-contained rechargeable batteries to supply power to the circuitry, and separate built-up battery chargers that operate on standard 115 v.a.c. power. Measurement accuracy, reliability, and dynamic range are superior to most commercially available equipment even though less time and effort is required to make null readings. GRA

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N75-15100*# Cornell Univ., New York. Dept. of Natural Resources.
EVALUATION OF SKYLAB IMAGERY AS AN INFORMATION SERVICE FOR INVESTIGATING LAND USE AND NATURAL RESOURCES Progress Report
Ernest E. Hardy, Principal Investigator 31 Dec. 1974 8 p EREP
(Contract NAS9-13364)
(E75-10106; NASA-CR-141372) Avail: NTIS HC $3.25 CSCL 08F

There are no author-identified significant results in this report.

N75-15101*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
REFORMATTING SKYLAB AND MSS DATA OVER NORTHERN INDIANA Monthly Report, Nov. 1974
LeRoy F. Silva, Principal Investigator Nov. 1974 1 p EREP
(Contract NAS9-13301)
(E75-10016; NASA-CR-140647) Avail: NTIS HC $3.25 CSCL 05B

There are no author-identified significant results in this report.

N75-15102*# Environmental Research Inst. of Michigan, Ann Arbor.
DEVELOPING PROCESSING TECHNIQUES FOR SKYLAB DATA Monthly Progress Report, Nov. 1974
Richard F. Nalepka and William A. Malila, Principal Investigators 18 Dec. 1974 5 p ref EREP
(Contract NAS9-13280)
(E75-10082; NASA-CR-141106; ERIM-101900-44-L) Avail: NTIS HC $3.25 CSCL 05B

There are no author-identified significant results in this report.

N75-15103*# Wolf Research and Development Corp., Pocomoke City, Md.
APPLICABILITY OF SKYLAB REMOTE SENSING FOR DETECTION AND MONITORING OF SURFACE MINING ACTIVITIES Quarterly Progress Report, 1 Oct. - 31 Dec. 1974
R. L. Brooks, Principal Investigator and J. D. Pennewell Jan. 1975 8 p EREP
(Contract NAS9-13310)
(E75-10085; NASA-CR-141149; QPR-4) Avail: NTIS HC $3.25 CSCL 08I

There are no author-identified significant results in this report.

N75-15104*# Tokyo Univ. (Japan).
INVESTIGATION OF THE ENVIRONMENTAL CHANGE PATTERN OF JAPAN Final Report, Jul. 1972 - Aug. 1973
Takakazu Maruyasu, Principal Investigator Oct. 1973 58 p Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E75-10086; NASA-CR-141150) Avail: NTIS HC $4.25 CSCL 04B

The author has identified the following significant results. ERTS-1 imagery clearly identifies the relationships between the status of erosion, effluent patterns affected by the coastal current, and the cultural construction activities. Simple photographic techniques can be used for detecting water mass distribution separately from cloud cover and also noise caused by reflected sunlight from wave surfaces. Polluted water does not diffuse continuously into the oceanic water, but forms masses in the water in the Kuroshio area. The polluted or turbid water in the area just north of the Tomogashima Channel, the south outlet of the Osaka Bay, shows that the northward tidal current runs in a clockwise eddy at the tidal period when the imagery was taken. Such an eddy-like pattern of tidal current had never been revealed by conventional oceanographic data. A front between an oceanic water mass and a polluted water mass runs in a NW-SE direction in the central part of the Osaka Bay. The patterns of turbid water discharged from the Kii River and Yoshino River show a northward tidal current in the North Kii Straits. The pattern of lighter turbid or polluted water located in the northwest region of the North Kii straits suggests the existence of a clockwise eddy in the straits.

N75-15105*# Northern Prairie Wildlife Research Center, Jamestown, N. Dak.
UTILIZATION OF SKYLAB (EREP) SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Monthly Progress Report, Dec. 1974
David S. Gilmer, Principal Investigator Dec. 1974 2 p EREP
(NASA Order T-4114-B)
(E75-10087; NASA-CR-141151) Avail: NTIS HC $3.25 CSCL 06C

There are no author-identified significant results in this report.

N75-15106*# Stanford Univ., Calif. School of Earth Sciences.
FEASIBILITY OF USING S-191 INFRARED SPECTRA FOR GEOLOGICAL STUDIES FROM SPACE Monthly Reports, 1 Jul. - 30 Nov. 1974
J. P. Lyon and F. R. Honey, Principal Investigators 30 Nov. 1974 3 p EREP
(Contract NAS9-13357)
(E75-10088; NASA-CR-141152; MR-12; MR-13; MR-14;

MR-15; MR-16) Avail: NTIS HC $3.25 CSCL 08G
There are no author-identified significant results in this report.

N75-15107*# Stanford Univ., Calif. School of Earth Sciences.
FEASIBILITY OF USING S-191 INFRARED SPECTRA FOR GEOLOGICAL STUDIES FROM SPACE Monthly Report, Dec. 1974
J. P. Lyon and F. R. Honey, Principal Investigators 30 Dec. 1974 3 p EREP
(Contract NAS9-13357)
(E75-10089; NASA-CR-141153; MR-17) Avail: NTIS HC $3.25 CSCL 08G
There are no author-identified significant results in this report.

N75-15108*# Delaware Univ., Newark. Coll. of Marine Studies.
MONITORING PHYSICAL AND CHEMICAL PARAMETERS OF DELAWARE BAY WATERS WITH AN ERTS-1 DATA COLLECTION PLATFORM Report on Significant Results
V. Klemas, Principal Investigator and C. Wethe 6 Jan. 1975 2 p ERTS
(Contract NAS5-21837)
(E75-10090; NASA-CR-141154) Avail: NTIS HC $3.25 CSCL 08J
The author has identified the following significant results. Results of the analysis of data collected during the summer of 1974 demonstrate that the ERTS Data Collection Platform (DCP) is quite responsive to changing water parameters and that this information can be successfully transmitted under all weather conditions. The monitoring of on-site probe outputs reveals a rapid response to changing water temperature, salinity, and turbidity conditions on incoming tides as the tidal salt wedge passes the probe location. The changes in water properties were corroborated by simultaneously sampling the water for subsequent laboratory analysis. Fluctuations observed in the values of salinity, conductivity, temperature and water depth over short time intervals were extremely small. Due to the nature of the probe, 10% to 20% fluctuations were observed in the turbidity values. The use of the average of the values observed during an overpass provided acceptable results. Good quality data was obtained from the satellite on each overpass regardless of weather conditions. Continued use of the DCP will help provide an indication of the accuracy of the probes and transmission system during long term use.

N75-15109*# Geological Survey, Reston, Va.
URBAN AND REGIONAL LAND USE ANALYSIS: CARETS AND CENSUS CITIES EXPERIMENT PACKAGE Monthly Progress Report
Robert Alexander, Principal Investigator, Daniel B. Gallagher, and Harry F. Lins, Jr. 20 Nov. 1974 3 p EREP
(NASA Order T-5290-B)
(E75-10091; NASA-CR-141155) Avail: NTIS HC $3.25 CSCL 08B
There are no author-identified significant results in this report.

N75-15110*# Environmental Research Inst. of Michigan, Ann Arbor.
STUDY OF RECREATIONAL LAND AND OPEN SPACE USING SKYLAB IMAGERY Monthly Progress Report, Nov. 1974
Irvin J. Sattinger, Principal Investigator 18 Dec. 1974 3 p EREP
(Contract NAS9-13283)
(E75-10092; NASA-CR-141156; ERIM-103300-40-L) Avail: NTIS HC $3.25 CSCL 08B
The author has identified the following significant results. Despite almost uniform surface temperature conditions in the study area, the thermal imagery did illustrate the following possible uses: (1) Surface temperatures relative to 0 C reveal whether the snow and ice cover is wet and the melt pattern. This information is useful in hydrologic monitoring of runoff timing and rate, as well as indicating trafficability conditions on the snow. (2) When the surface temperature of snow and ice is below freezing, it may serve as an indicator of spatial variation of air temperatures. This information may be used in calculating the spatial variation of surface radiation budgets, or in observing synoptic weather condition changes or local microclimatic effects. (3) Frozen inland lakes with less than about three or four inches of snow over the ice may be differentiated from surrounding snow covered land areas; this is not always feasible in visible wavelength imagery. The feasibility of this application decreases as the ice thickness increases.

N75-15111*# Environmental Research Inst. of Michigan, Ann Arbor.
A SKYLAB PROGRAM FOR THE INTERNATIONAL HYDROLOGICAL DECADE (IHD) Quarterly Report, Jun. - Aug. 1974
Fabian C. Polcyn, Principal Investigator and Diana L. Rebel 9 Dec. 1974 3 p EREP
(Contract NAS9-13275)
(E75-10093; NASA-CR-141157; ERIM-102300-13-L) Avail: NTIS HC $3.25 CSCL 08H
The author has identified the following significant results. The development of the algorithm (using real data) relating red and IR reflectance to surface soil moisture over regions of variable vegetation cover will enable remote sensing to make direct inputs into determination of this important hydrologic parameter.

N75-15112*# Environmental Research Inst. of Michigan, Ann Arbor.
A SKYLAB PROGRAM FOR THE INTERNATIONAL HYDROLOGICAL DECADE (IHD) Quarterly Report, Mar. - May 1974
Fabian C. Polcyn, Principal Investigator and Diana L. Rebel 9 Dec. 1974 3 p EREP
(Contract NAS9-13275)
(E75-10094; NASA-CR-141057; ERIM-102300-12-L) Avail: NTIS HC $3.25 CSCL 08H
There are no author-identified significant results in this report.

N75-15113*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
ANALYSIS OF SKYLAB MSS DATA, AND CALIBRATION OF THERMAL DATA OVER LAKE MONROE, INDIANA Monthly Report, Dec. 1974
LeRoy F. Silva, Principal Investigator Dec. 1974 2 p EREP
(Contract NAS9-13301)
(E75-10095; NASA-CR-141291) Avail: NTIS HC $3.25 CSCL 08H
The author has identified the following significant results. The SL/4-S192 data over northern Indiana looks good. The thermal band looks very encouraging. The preliminary analysis indicates so far that it will be difficult to distinguish some land use classes because of the lack of vegetation. Preliminary analysis of the thermal band in particular indicates that there appears to be a correlation of the hot spots in the data over the Ft. Wayne, Indiana area and its industrial centers.

N75-15114*# Environmental Research Inst. of Michigan, Ann Arbor.
DETERMINATION OF THE EARTH'S AEROSOL ALBEDO USING SKYLAB DATA Quarterly Progress Report, Aug. - Dec. 1974
Robert E. Turner, Principal Investigator 13 Jan. 1975 2 p EREP
(Contract NAS9-13279)
(E75-10096; NASA-CR-141292; ERIM-102200-14-L) Avail: NTIS HC $3.25 CSCL 04A
There are no author-identified significant results in this report.

N75-15115*# Wyoming Univ., Laramie. Remote Sensing Lab.
USEFULNESS OF SKYLAB COLOR PHOTOGRAPHY AND ERTS-1 MULTISPECTRAL IMAGERY FOR MAPPING RANGE VEGETATION TYPES IN SOUTHWESTERN WYOMING Special Report
Robert C. Gordon, Principal Investigator [1974] 56 p refs ERTS and EREP

(Contracts NAS5-21799; NAS9-13298)
(E75-10097; NASA-CR-141293) Avail: NTIS HC $4.25 CSCL 08B

The author has identified the following significant results. Aerial photography at scales of 1:43,400 and 1:104,500 was used to evaluate the usefulness of Skylab color photography (scales of 1:477,979 and 1:712,917) and ERTS-1 multispectral imagery (scale 1:1,000,000) for mapping range vegetation types. The project was successful in producing a range vegetation map of the 68,000 acres of salt desert shrub type in southwestern Wyoming. Techniques for estimation of above-ground green biomass have not yet been confirmed due to the mechanical failure of the photometer used in obtaining relative reflectance measurement. However, graphs of log transmittance versus above-ground green biomass indicate that production estimates may be made for some vegetation types from ERTS imagery. Other vegetation types not suitable for direct ERTS estimation of green biomass may possibly be related to those vegetation types whose production has been estimated from the multispectral imagery.

N75-15116*# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
REMOTE SENSING OF OCEAN CURRENT BOUNDARY LAYER Monthly Progress Report, Dec. 1974
George A. Maul, Principal Investigator 9 Jan. 1975 2 p EREP
(NASA Order T-4713-B)
(E75-10098; NASA-CR-141294) Avail: NTIS HC $3.25 CSCL 08J

There are no author-identified significant results in this report.

N75-15117*# National Oceanic and Atmospheric Administration, Washington, D.C.
A CLOUD PHYSICS INVESTIGATION UTILIZING SKYLAB DATA Quarterly Progress Report, Oct. - Dec. 1974
John Alishouse, Herbert Jacobowitz, and David Wark, Principal Investigators Dec. 1974 5 p EREP
(NASA Order T-4715-B)
(E75-10099; NASA-CR-141295; QPR-7) Avail: NTIS HC $3.25 CSCL 04A

There are no author-identified significant results in this report.

N75-15118*# Geological Survey, Reston, Va.
URBAN AND REGIONAL LAND USE ANALYSIS: CARETS AND CENSUS CITIES EXPERIMENT PACKAGE Monthly Progress Report
Robert Alexander, Principal Investigator and Harry F. Lins, Jr. 27 Dec. 1974 4 p EREP
(NASA Order T-5290-B)
(E75-10100; NASA-CR-141296) Avail: NTIS HC $3.25 CSCL 08B

There are no author-identified significant results in this report.

N75-15119*# National Oceanic and Atmospheric Administration, Rockville, Md. Coastal Mapping Div.
SKYLAB: A PROPOSAL AEROTRIANGULATION WITH VERY SMALL SCALE PHOTOGRAPHY Quarterly Report, 15 Oct. 1974 - 15 Jan. 1975
Morton Keller, Principal Investigator 15 Jan. 1975 1 p EREP
(NASA Order T-4110-B)
(E75-10101; NASA-CR-141297) Avail: NTIS HC $3.25 CSCL 08B

There are no author-identified significant results in this report.

N75-15120*# Nevada Univ., Reno. Mackay School of Mines.
THE GREAT BASIN INVESTIGATION Monthly Progress Report, Dec. 1974
Jack G. Quade, Principal Investigator Dec. 1974 2 p EREP
(Contract NAS9-13274)
(E75-10102; NASA-CR-141298) Avail: NTIS HC $3.25 CSCL 08G

There are no author-identified significant results in this report.

N75-15121*# Maine State Highway Dept., Bangor.
MULTIDISCIPLINARY ANALYSIS FOR HIGHWAY ENGINEERING PURPOSES Progress Report
Ernest G. Stoeckeler, Raymond G. Woodman, and Robert S. Farrell, Principal Investigators 6 Nov. 1974 7 p EREP
(Contract NAS9-13359)
(E75-10103; NASA-CR-141304; PR-4) Avail: NTIS HC $3.25 CSCL 13B

There are no author-identified significant results in this report.

N75-15122*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
AN INTERDISCIPLINARY ANALYSIS OF MULTISPECTRAL SATELLITE DATA FOR SELECTED COVER TYPES IN THE COLORADO MOUNTAINS, USING AUTOMATIC DATA PROCESSING TECHNIQUES Monthly Progress Report, Dec. 1974
Roger M. Hoffer, Principal Investigator Dec. 1974 11 p EREP
(Contract NAS9-13380)
(E75-10104; NASA-CR-141305) Avail: NTIS HC $3.25 CSCL 08F

The author has identified the following significant results. In the San Juan Mountains there exists a group of structural and topographic features which suggest a common origin. The relative positions of the San Juan Depression with the Silverton and Lake City Calderas indicate they are possibly on the edge of a large circular feature. Comparison with the 1:250,000 scale Durango Geologic Map reveals a series of radial and arcuate faults concentric with the major circular feature. Such a fracture pattern implies that the circular feature may represent the extent of a major domal uplift in the area. The uplift was very likely due to the sub-crustal emplacement of the parent magma of the San Juan volcanics and intrusives. The broad doming led to the formation of a zone of tensional ring fractures which acted as conduits of release for the magma and the eventual development of the various calderas. The ring fracturing was probably incomplete with hinging occurring in the southern and southwestern portions of the dome accounting for the lack of development of caldera structures in that portion of the area.

N75-15123*# Colorado School of Mines, Golden. Dept. of Geology.
GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO, USING SKYLAB EREP DATA Monthly Progress Report, Dec. 1974
Keenan Lee, Principal Investigator 20 Jan. 1975 4 p EREP
(Contract NAS9-13394)
(E75-10105; NASA-CR-141306) Avail: NTIS HC $3.25 CSCL 08G

There are no author-identified significant results in this report.

N75-15124*# California Earth Science Corp., Santa Monica.
FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES, SOUTHERN CALIFORNIA Monthly Progress Report, Dec. 1974
Paul M. Merifield, Principal Investigator 5 Jan. 1975 2 p EREP
(Contract NAS2-7698)
(E75-10108; NASA-CR-140898; MPR-19) Avail: NTIS HC $3.25 CSCL 08G

There are no author-identified significant results in this report.

N75-15125*# Agricultural Research Service, Weslaco, Tex.
IRRIGATION SCHEDULING, FREEZE WARNING AND SOIL SALINITY DETECTING Monthly Progress Report, Jan. 1975
Craig L. Wiegand, Principal Investigator Jan. 1975 4 p EREP
(NASA Order T-4105-B)
(E75-10109; NASA-CR-140899; MPR-13) Avail: NTIS HC $3.25 CSCL 02C

There are no author-identified significant results in this report.

N75-15126*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE AVAILABILITY OF LOCAL AERIAL PHOTOGRAPHY IN SOUTHERN CALIFORNIA
Walter Allen, III, Brenda Sledge, Charles K. Paul, and Albert J. Landini 1 Dec. 1974 29 p
(Contract NAS7-100)
(NASA-CR-141314; JPL-SP-43-14) Avail: NTIS HC $3.75 CSCL 14E

Some of the major photography and photogrammetric suppliers and users located in Southern California are listed. Recent trends in aerial photographic coverage of the Los Angeles basin area are also noted, as well as the uses of that imagery. Author

N75-15127*# Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
THE USE OF COLOR INFRARED IMAGERY FOR THE STUDY OF MARSH BUGGY TRACKS
Charles A. Whitehurst and Linda N. Doiron [1974] 13 p refs Original contains color illustrations
(Grant NGL-19-001-105)
Avail: NTIS HC $3.25 CSCL 08H

Color infrared imagery is used to determine the location of buggy routes and to quantify the extent of tracks in a selected area where the marsh is seriously dissected. The imagery is used to show successive stages of destruction. It is recommended that alternate routes be identified in the oeprating area to eliminate continuous use of the same route and facilitate faster revegetation. Author

N75-15128*# Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
GEOMORPHIC PROCESSES ACTIVE IN THE SOUTHWESTERN LOUISIANA CANAL, LAFOURCHE PARISH, LOUISIANA
Linda N. Doiron (Calif. Univ., Los Angeles) and Charles A. Whitehurst Oct. 1974 48 p refs
(Grants NGL-19-001-024; NGL-19-001-097)
(NASA-CR-141309) Avail: NTIS HC $3.75 CSCL 08H

The geomorphological changes causing the destruction of the banks of the Southwestern Louisiana Canal are studied by means of field work, laboratory analyses, and infrared color imagery interpretation. Turbulence and flow patterns are mapped, and related to erosion and sediment deposition processes. The accelerated erosion rate of the last decade is discussed, with two causative factors cited: (1) development of faster boats, increasing bank and bottom erosion, and (2) a subsequently larger tidal influx, with greater erosive ability. The physical properties of the canal bank materials are also analyzed. It is concluded that channel erosion progressively increases, with no indications of stabilization, until they merge with other waterways and become indistinguishable from natural water bodies. N.E.R.

N75-15129*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
THE 4-8 GHz MICROWAVE ACTIVE AND PASSIVE SPECTROMETER (MAPS). VOLUME 1: RADAR SECTION
Fawwaz T. Ulaby Apr. 1973 66 p refs
(Contracts NAS9-10261; DAAK02-68-C-0089)
(NASA-CR-141474; CRES-TR-177-34-Vol-1) Avail: NTIS HC $4.25 CSCL 17I

The performance characteristics of the radar section of the prototype 4-8 GHz Microwave Active and Passive Spectrometer system are reported. Active and passive spectral responses were measured of natural, cultivated, and human-made surfaces over the 4-18 GHz region of frequencies for look angles between zero and 70 degrees and for all possible linear polarization combinations. Soil and plant samples were collected to measure their dielectric properties and moisture content. The FORTRAN program for area calculation is provided. Author

N75-15130*# Clemson Univ., S.C. Dept. of Horticulture.
CROP STATUS EVALUATIONS AND YIELD PREDICTIONS Monthly Progress Report, 1 Dec. 1974 - 1 Jan. 1975
J. R. Haun 1 Jan. 1975 10 p
(Contract NAS9-14006)
(NASA-CR-141277) Avail: NTIS HC $3.25 CSCL 02B

A model was developed for predicting the day 50 percent of the wheat crop is planted in North Dakota. This model incorporates location as an independent variable. The Julian date when 50 percent of the crop was planted for the nine divisions of North Dakota for seven years was regressed on the 49 variables through the step-down multiple regression procedure. This procedure begins with all of the independent variables and sequentially removes variables that are below a predetermined level of significance after each step. The prediction equation was tested on daily data. The accuracy of the model is considered satisfactory for finding the historic dates on which to initiate yield prediction model. Growth prediction models were also developed for spring wheat. Author

N75-15131*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
INVESTIGATION OF TRANSIENT EARTH RESOURCES PHENOMENA: CONTINUATION STUDY Final Report, 31 Jan. - 30 Sep. 1974
Gary C. Goldman et al Nov. 1974 125 p refs
(Contract NAS5-20021)
(NASA-CR-139163; ERIM-107400-2-F) Avail: NTIS HC $5.25 CSCL 08E

Calculated sensitivity requirements for an earth resource satellite in a geostationary orbit are reported. Radiance levels at the satellite sensor were computed for twenty top-priority Synchronous Earth Observatory Satellite (SEOS) applications. The observation requirements were reviewed and re-evaluated in terms of spectral band definition, spectral signatures of targets and backgrounds, observation time, and site location. With these data and an atmospheric attenuation and scattering model, the total radiances observed by the SEOS sensor were calculated as were the individual components contributed by the target, target variations, and the atmosphere. Author

N75-15132*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GEOLOGIC STRUCTURE IN CALIFORNIA: THREE STUDIES WITH ERTS-1 IMAGERY
Paul D. Lowman, Jr. Nov. 1974 23 p refs Submitted for publication
(NASA-TM-X-70799; X-922-74-314) Avail: NTIS HC $3.25 CSCL 08G

Results are presented of three early applications of imagery from the NASA Earth Resources Technology Satellite to geologic studies in California. In the Coast Ranges near Monterey Bay, numerous linear drainage features possibly indicating unmapped fracture zones were mapped within one week after launch of the satellite. A similar study of the Sierra Nevada near Lake Tahoe revealed many drainage features probably formed along unmapped joint or faults in granitic rocks. The third study, in the Peninsular Ranges, confirmed existence of several major faults not shown on published maps. One of these, in the Sawtooth Range, crosses in Elsinore fault without lateral offset; associated Mid-Cretaceous structures have also been traced continuously across the fault without offset. It therefore appears that displacement along the Elsinore fault has been primarily of a dip-slip nature, at least in this area, despite evidence for lateral displacement elsewhere. Author

N75-15133*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A DEMONSTRATION OF ERTS-1 ANALOG AND DIGITAL TECHNIQUES APPLIED TO STRIP MINING IN MARYLAND AND WEST VIRGINIA
Arthur T. Anderson and Jane Schubert Nov. 1974 19 p refs Submitted for publication
(NASA-TM-X-70798; X-923-74-313) Avail: NTIS HC $3.25 CSCL 08I

The largest contour strip mining operations in western Maryland and West Virginia are located within the Georges Creek and the Upper Potomac Basins. These two coal basins lie within the Georges Creek (Wellersburg) syncline. The disturbed strip mine areas were delineated with the surrounding geological and vegetation features using ERTS-1 data in both analog (imagery) and digital form. The two digital systems used were: (1) the

ERTS-Analysis system, a point-by-point digital analysis of spectral signatures based on known spectral values, and (2) the LARS Automatic Data Processing System. The digital techniques being developed will later be incorporated into a data base for land use planning. These two systems aided in efforts to determine the extent and state of strip mining in this region. Aircraft data, ground verification information, and geological field studies also aided in the application of ERTS-1 imagery to perform an integrated analysis that assessed the adverse effects of strip mining. The results indicated that ERTS can both monitor and map the extent of strip mining to determine immediately the acreage affected and indicate where future reclamation and revegetation may be necessary. Author

N75-15134*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SURFACE GEOMETRY OF INHERITED JOINT AND FRACTURE TRACE PATTERNS RESULTING FROM ACTIVE AND PASSIVE DEFORMATION
Melvin H. Podwysocki and David P. Gold (Penn. State Univ.) Jul. 1974 45 p refs Submitted for publication
(NASA-TM-X-70794; X-923-74-222) Avail: NTIS HC $3.75 CSCL 08E

Hypothetical models are considered for detecting subsurface structure from the fracture or joint pattern, which may be influenced by the structure and propagated to the surface. Various patterns of an initially orthogonal fracture grid are modeled according to active and passive deformation mechanisms. In the active periclinal structure with a vertical axis, fracture frequency increased both over the dome and basin, and remained constant with decreasing depth to the structure. For passive periclinal features such as a reef or sand body, fracture frequency is determined by the arc of curvature and showed a reduction over the reefmound and increased over the basin. Author

N75-15135# California Univ., Berkeley. School of Forestry and Conservation.
USEFULNESS OF REMOTE SENSING TECHNIQUES FOR THE ENVIRONMENTAL MONITORING OF THE SACRAMENTO-SAN JOAQUIN DELTA Final Report
William C. Draeger 1 Feb. 1974 55 p refs Sponsored by Calif. Dept. of Water Resources
Avail: NTIS HC $4.25

Information is presented on the capabilities of using remote sensing technology in an environmental monitoring program for the Sacramento-San Joaquin delta. Remote sensing literature pertaining to water quality measurement was reviewed to define the current state-of-the-art and to ascertain the possibility of evaluating the water quality parameters. Based on the findings of the review, a number of experimental aerial photo flights over the delta were conducted and coordinated with on-the-water measurements. Water quality parameters, the measurement accuracies needed, and the required frequency or timing of measurement are discussed. It was found that annual, small-scale color photographic coverage and periodic hand-held photography from a light plane permit subjective evaluations of direct on-the-water measurements. M.J.S.

N75-15136*# Scientific Translation Service, Santa Barbara, Calif.
FUNDAMENTALS OF THE SPACE INDICATION OF EARTH RESOURCES
V. V. Andreyanov Washington NASA Jan. 1975 62 p Transl. into ENGLISH from the Russian report D-171
(Contract NASw-2483)
(NASA-TT-F-16108; D-171) Avail: NTIS HC $4.25 CSCL 08E

The methods and instrumentation used in satellite reconnaissance of earth features are reviewed. The electromagnetic spectrum of solar radiation is analyzed along with the atmospheric effects on the transmission of visible and infrared radiation. Statistical methods are given for the identification of natural features and the determination of their characteristics. Remote sensing and data transmission requirements for satellites and the affect of orbit parameters on the results and condition of measurements is given. The principles of operation and the characteristics of photographic and television cameras, scanning radiometers, and active radar methods for the investigation of earth's resources are discussed. Author

N75-15137# Ludwig-Maximilians-Universitat, Munich (West Germany).
OBSERVATIONAL RESULTS FROM THE GEOMAGNETIC OBSERVATORY FUERSTENFELDBRUCK FOR THE YEARS 1944 - 1947 [ERGEBNISSE DER BEOBACHTUNGEN AM ERDMAGNETISCHEN OBSERVATORIUM FUERSTENFELDBRUCK IN DEN JAHREN 1944 - 1947]
1974 143 p ref In GERMAN
Avail: NTIS HC $5.75

Data tables include hourly, daily, monthly and yearly measurements on declination, horizontal intensity and vertical intensity of the geomagnetic field surrounding Munich.
Transl. by G.G.

N75-15138*# Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
MULTISPECTRAL PHOTOGRAPHY FOR EARTH RESOURCES
Sondra Wenderoth, Edward Yost, Rajender Kalia, and Robert Anderson 1972 279 p refs Original contains color illustrations
(Contract NAS9-11188)
(NASA-CR-141283) Avail: NTIS HC $8.75 CSCL 14E

A guide for producing accurate multispectral results for earth resource applications is presented along with theoretical and analytical concepts of color and multispectral photography. Topics discussed include: capabilities and limitations of color and color infrared films; image color measurements; methods of relating ground phenomena to film density and color measurement; sensitometry; cosiderations in the selection of multispectral cameras and components; and mission planning. F.O.S.

N75-15139# Atomic Energy Commission, Washington, D.C.
PROJECT RIO BLANCO DEFINITION PLAN, ALTERNATE REENTRY AND TESTING
May 1974 94 p Prepared jointly with Continental Oil Co., Ponca City, Okla.
(Proj. Rio Blanco)
(NVO-145; PNE-RB-57) Avail: NTIS HC $4.75

The Rio Blanco event was an underground nuclear explosion detonated on May 17, 1973 as part of a program for evaluating the feasibility of nuclear stimulation of natural gas production. Initial reentry drill hole data indicated that the chimney from the three explosives used in the experiment and simultaneously detonated at three different depths, did not connect and that the gas flow from the top chimney was much lower than expected. In order to completely evaluate the stimulation effects, more data are needed, and a second, or alternate, reentry hole is planned. The drilling, production testing, formation sampling, safety, security, environmental aspects and project management aspects, including scheduling and cost estimates, of this second reentry operation are presented. NSA

N75-15140# Army Foreign Science and Technology Center, Charlottesville, Va.
ANALYTIC PHOTOGRAMMETRY
A. N. Lobanov 19 Mar. 1974 182 p refs Transl. into ENGLISH from the book "Analiticheskaya Fotogrammetriya" Moscow, 1972 p 103-104
(AD-786784; FSTC-HT-23-1729-73) Avail: NTIS CSCL 08/2

Results of practical work in the Soviet Union on automating the plotting of photogrammetric nets using digital computers are described. Computer programs involving the Ural-1, Strela, M-20, Ural-2, Razdan-2, M-20, and M-220 computers are presented in this application. Automated stereocomparators and monocomparators of foreign manufacture are compared, along with Soviet models. Analytic instruments for compiling topographic maps and photodocuments are discussed, including the analytic phototransformer and the analytic cartograph. The automation of photographic interpretation concludes the main part of the text excerpts. GRA

N75-15141# Center for Naval Analyses, Arlington, Va. Warfare Analysis Group.
THE GLOBAL COMPUTER PROGRAM AND GLOBEMAP: A SPECIAL PURPOSE THREE-DIMENSIONAL PLOTTER SUBROUTINE
Lewis W. Linton Jul. 1974 45 p

(Contract N00014-68-A-0091)
(AD-785869; NWAG-Research-Contrib-266) Avail: NTIS CSCL 08/5

GLOBALL manipulates several smaller computer programs to calculate global ranges and surface areas. GLOBEMAP provides a three-dimensional map background upon which the ranges and areas may be presented. This paper is not intended to be a user's manual but to describe characteristics of these models and possible applications of them. Author (GRA)

N75-15142# Naval Weapons Lab., Dahlgren, Va.
PRACTICAL REALIZATION OF A REFERENCE SYSTEM FOR EARTH DYNAMICS BY SATELLITE METHODS
Richard J. Anderle and Mark G. Tanenbaum Aug. 1974 53 p refs
(AD-785843; NWL-TR-3161) Avail: NTIS CSCL 08/5

Observations of artificial earth satellites provide a means of establishing an origin, orientation, scale and control points for a coordinate system. Neither existing data nor future data are likely to provide significant information on the .001 in. angle between the axis of the angular momentum and axis of rotation. Existing data have provided data to about .01 in. accuracy on the pole position and to possibly a meter on the origin of the system and for control points. The longitude origin is essentially arbitrary. While these accuracies permit acquisition of useful data on tides and polar motion through dynamic analyses, they are inadequate for determination of crustal motion or significant improvement in polar motion. The limitations arise from gravity, drag and radiation forces on the satellites as well as from instrument errors. Improvements in laser equipment and the launch of the dense LAGEOS satellite in an orbit high enough to suppress significant gravity and drag errors will permit determination of crustal motion and more accurate, higher frequency, polar motion. (Modified author abstract) GRA

N75-15143# Army Foreign Science and Technology Center, Charlottesville, Va.
THE NEXT PROBLEMS IN THE AREA OF THE IMPLEMENTATION OF PLANNING FOR CARTOGRAPHICAL-GEODETIC WORK
L. A. Kashin 21 Feb. 1974 12 p Transl. into ENGLISH from Geodeziya i Kartografiya (Moscow), no. 7, 1972 p 1-5
(AD-785882; FSTC-HT-23-1558-73) Avail: NTIS CSCL 08/5

Geodesy and cartography in the Soviet Union are discussed. A brief history of the improvements and changes over the past few years is given. GRA

N75-15144# Woods Hole Oceanographic Institution, Mass.
THE DESIGN AND PERFORMANCE OF A FREE-FALL ELECTRO-MAGNETIC VELOCITY PROFILER (EMVP)
Thomas B. Sanford, Robert G. Drever, and John H. Dunlap Jul. 1974 126 p refs
(Contract N00014-66-C-0241; NR Proj. 083-004)
(AD-786315; WHOI-74-46; WHOI-TR-5) Avail: NTIS CSCL 08/3

The principles of operation, the construction and the performance are described for a free-fall Electro-Magnetic Velocity Profiler (EMVP). The device measures and records weak electric currents produced by the motion of the sea through the geomagnetic field. The electric current measurements as a function of depth are interpreted in terms of the depth variable, horizontal velocity field. A complete velocity profile in 6000 m of water is achieved in about 1 1/2 hours with an accuracy of about 1 cm/s at a vertical resolution of 10 m. In addition to velocity, temperature, electrical conductivity and pressure are recorded once per second for a vertical resolution of about 1 m. (Modified author abstract) GRA

N75-15145# Army Foreign Science and Technology Center, Charlottesville, Va.
THE SIMULTANEOUS LEVELING OF GRID NETWORKS IN VERTICAL PHOTOTRIANGULATION
M. N. Bulushev 10 Jan. 1974 11 p Transl. into ENGLISH from Geodeziya i Kartografiya (USSR), no. 7, 1972 p 33-38
(AD-786837; FSTC-HT-23-1563-73) Avail: NTIS CSCL 08/2

The authors discuss two variants for the simultaneous leveling of three-dimensional triangulation networks. The coordinates of the geodesic and connecting points are determined with aid of interpolation polynomials whose accuracy is improved in each approximation. A program for the second variant was written for the Razdan-2 electronic computer. GRA

N75-15146# Army Foreign Science and Technology Center, Charlottesville, Va.
USE OF FOREST VEGETATION AS AN INDICATOR IN THE INTERPRETATION AND LARGE SCALE MAPPING OF SOILS IN A FOREST ZONE
A. M. Berezin 19 Nov. 1973 14 p refs Transl. into ENGLISH from the book "Krupnomasshtabnoe Kartografiya Rastitelnosti" Novosibirsk, 1970 p 102-110
(AD-785967; FSTC-HT-23-1297-73) Avail: NTIS CSCL 08/13

Field research into forest types and their relations to soil types, types of tertiary deposits and underlying rocks were correlated with interpretation of the same items from aerial photographs, in selected regions of the Ukraine and Karelia. Aerial spectral region photographs proved to be more suitable than black and white aerial photos. The relationship of alluvial-slopewash deposits to ravine black alder, thick fluvioglacial sands covered with foxberry pine forests and organogenic deposits with rosemary-sphagnum pine forests are the most clearly interpreted from aerial photos. Further investigations in other regions should allow generalization of the results and their introduction into forest zone soil and tertiary deposit mapping. GRA

N75-15147# Defense Mapping Agency Aerospace Center, St. Louis, Mo.
FULLY AUTOMATED COMPILATION OF GRAVITY AND GEOPHYSICAL MAPS
Luman E. Wilcox, Joe M. Estes, and Walter Czarnecki Sep. 1974 69 p refs
(AD-785838; DMAAC-TP-74-002) Avail: NTIS CSCL 08/2

A wide variety of gravity and geophysical maps can be produced by fully automated methods. The locations of gravity measurements, gravity anomaly values, gravity anomaly contours, continental outlines, title, legend, labels, and other data to be shown on the maps are computer generated, then drawn by automatic plotting equipment. This procedure is used to prepare charts showing the density and distribution of gravity data holdings, contoured gravity anomaly maps and other graphics needed for gravity data evaluation and mean anomaly prediction purposes, maps of gravity station elevations used as vertical control in topographic map compilation, and maps of glacial ice thickness for geophysical analysis. (Modified author abstract) GRA

N75-15148# Colorado State Univ., Fort Collins. Environmental Resources Center.
SNOW-AIR INTERACTIONS AND MANAGEMENT OF MOUNTAIN WATERSHED SNOWPACK
James R. Meiman and Lewis O. Grant Jun. 1974 40 p refs
(Contract DI-14-31-0001-3568)
(PB-235825/7; OWRR-B-073-COLO(2); W74-12201) Avail: NTIS HC $3.75 CSCL 08H

Evaporation losses from mountain snowpacks amounted to approximately 60% of the snow season precipitation in an alpine setting and to approximately 45% in a forest opening. Forest clearings similar to those studied should not result in greater snow evaporation losses if they are kept small enough to prevent wind transport of snow. Periodic removal of ridgeline snow deposits into the cirque below resulted in an increase of water yield equivalent to 240 acre-feet of water per mile of ridgeline treated. A water-budget analysis of the alpine feeder area indicated that nearly 80% of the seasonal precipitation was transported out of the region by the end of the winter study period, 30 April. (Modified author abstract) GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N75-15149*# Scientific Translation Service, Santa Barbara, Calif.
SOLAR ENERGY
Takashi Horigome and Tatsuo Tani Washington NASA Dec. 1974 18 p Transl. into ENGLISH from Saiensu (Japan), Mar. 1974 p 47-53
(Contract NASw-2483)
(NASA-TT-F-16092) Avail: NTIS HC $3.25 CSCL 10A

The use of solar energy, the techniques to be employed, and future prospects of solar energy as a widespread energy source are discussed. Diagrams of solar power systems are presented. Author

N75-15150# Joint Committe on Atomic Energy (U. S. Congress).
DEVELOPMENT, GROWTH, AND STATE OF THE NUCLEAR INDUSTRY
Washington GPO 1974 609 p refs Hearings before Joint Comm. on Atomic Energy, 93d Congr., 2d Sess., 5-6 Feb. 1974
(GPO-33-873) Avail: SOD HC $5.00

The hearings are reported concerning the production of power by nuclear energy. Topics discussed include: AEC-Industry relationship, Project Independence, advanced breeder concepts, contributions of the nuclear industry to alleviate reliance on foreign sources of fuel, sources of uranium, and nuclear fuel cycle. F.O.S.

N75-15151# Committee on Ways and Means (U. S. Senate).
TAX TREATMENT OF RECYCLING OF SOLID WASTE
Washington GPO 1974 386 p refs Hearings before Comm. on Ways and Means, 93d Congr., 2d Sess., 20-21 Mar. 1974
(GPO-31-090) Avail: Comm. on Ways and Means

The testimony is reported concerning the program to establish tax incentives for automobile scrap processing, treatment of beverage containers, recycling waste paper, and waste energy conversion. Incentives as special tax deductions or credits for reducing the cost of scrap or other recyclable materials to processors are discussed along with the rapid amortization of tax credits to encourage capital investment in recycling facilities. The recovery of the energy in municipal wastes is also discussed. F.O.S.

N75-15152*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE 1973 GSFC BATTERY WORKSHOP, FIRST DAY
13 Nov. 1973 193 p Workshop held at Greenbelt, Md., 13 Nov. 1973
(NASA-TM-X-72536) Avail: NTIS HC $7.00 CSCL 10C

A review of current battery technology is presented. The following major areas are discussed: (1) seals; (2) separators; (3) storage experience; and (4) manufacturing. J.M.S.

N75-15153*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AN EVALUATION: THE POTENTIAL OF DISCARDED TIRES AS A SOURCE OF FUEL
L. W. Collins, W. R. Downs, E. K. Gibson, and G. W. Moore (Lockheed Electronics Co., Houston, Tex.) Dec. 1974 17 p refs
(NASA-TM-X-58143; JSC-09243) Avail: NTIS HC $3.25 CSCL 10A

The destructive distillation of rubber tire samples was studied by thermogravimetry, differential scanning calorimetry, combustion calorimetry, and mass spectroscopy. The decomposition reaction was found to be exothermic and produced a mass loss of 65 percent. The gas evolution curves that were obtained indicate that a variety of organic materials are evolved simultaneously during the decomposition of the rubber polymer. Author

N75-15154*# Kanner (Leo) Associates, Redwood City, Calif.
REPORT OF THE WIND POWER COMMITTEE
Washington NASA Jan. 1975 117 p Transl. into ENGLISH from Dan. Elvaer Foren. (Copenhagen), 1962
(Contract NASw-2481)
(NASA-TT-F-16062) Avail: NTIS HC $5.25 CSCL 01B

Wind-generated electricity was studied at an experimental mill and at wind measuring stations which consisted of a measuring cylinder mounted on a steel mast at elevations of 25 and 50 m. The mill is evaluated in terms of its cost and performance and is compared to other experimental mills in these terms. A system of economic models is presented which compares the costs for wind- and steam-generated electricity, with the conclusion that a wind power plant such as the one studied is unable to compete with a steam power plant. Wind power is held to be useful as a replacement for imported fuel and as a power reserve. Supplementary material on effect calculations and performance characteristics is also provided. Author

N75-15155# Committee on Interior and Insular Affairs (U. S. Senate).
THE PROSPECTS FOR GASOLINE AVAILABILITY: 1974
David Lindahl Washington GPO 1974 138 p refs Background paper presented to Comm. on Interior and Insular Affairs pursuant to S. Res. 45, 93d Congr., 2d Sess., 20 Jun. 1974 Prepared by the Library of Congr., Congressional Res. Service
(GPO-34-969) Avail: SOD HC $1.35 CSCL 21D

The projected availability of gasoline is reported for the use of the Senate's National Fuels and Energy Policy Study. An overview of the problems of supply and demand for gasoline in the U.S. is given. Factors and developments affecting gasoline supply and demand are examined. Gasoline availability is assessed and the impact of shortages is discussed. Two related documents are included: (1) a post-embargo supply-demand outlook; and (2) a brief report on the gasoline supply picture. J.M.S.

N75-15156*# Science Applications, Inc., Huntsville, Ala.
RADIATION DEGRADATION OF SOLAR CELL ARRAYS Final Report
C. W. Hill 17 Jan. 1975 17 p refs
(Contract NAS8-30806)
(NASA-CR-120596) Avail: NTIS HC $3.25 CSCL 10A

A method of incorporating a detailed solar cell radiation degradation model into a convenient computational scheme suitable for the solar electric propulsion system is outlined. The study shows that several existing codes may be applied in sequence to solve the problem. Author

N75-15157*# United Air Lines, Inc., San Francisco, Calif.
FUEL CONSERVATION CAPABILITY AND EFFORT BY COMMERCIAL AIR CARRIERS
May 1974 19 p
(Contract NAS2-7208)
(NASA-CR-137624) Avail: NTIS HC $3.25 CSCL 10B

Computer capability weather input data, performance data, and ATC interface are discussed in terms of their role in preflight and inflight planning for commercial flights. The effect of preflight and inflight planning on fuel efficient operation was evaluated along with the impact of avionics. It was found that there is a potential fotr saving fuel through use of avionics, especially in the area of vertical guidance in all phases of flight. Other results of the study indicate: (1) preflight planning as it now stands is adequate with the exception that more accurate and up-to-date weather information is desirable; (2) better inflight information about existing weather conditions is needed; and (3) ATC can aid in fuel conservation. M.J.S.

N75-15158# Committee on Interior and Insular Affairs (U. S. Senate).
OVERSIGHT: MANDATORY PETROLEUM ALLOCATION PROGRAMS, PART 1
Washington GPO 1974 199 p Hearings before Comm. on Interior and Insular Affairs pursuant to S. Res. 45, 93d Congr., 2d Sess., 27 Feb. 1974
(GPO-30-060) Avail: Comm. on Interior and Insular Affairs

The impact and effectiveness of allocation programs are evaluated. The operation of the allocation system is examined with emphasis on the following areas: (1) adequacy of allocations to rapid growth areas; (2) impact of allocations on public transportation; (3) relationships between the allocation program and crude oil imports; and (4) effect of allocation regulations on gasoline retailers. Basic questions about energy are explored. J.M.S.

N75-15159# Committee on Interior and Insular Affairs (U. S. Senate).
OVERSIGHT: MANDATORY PETROLEUM ALLOCATION PROGRAMS, PART 2
Washington GPO 1974 387 p refs Hearings before Comm. on Interior and Insular Affairs Pursuant to S. Res. 45, 93d Congr., 2d Sess., 14-15 Feb. 1974
(GPO-31-519) Avail: Comm. on Interior and Insular Affairs

Testimony is presented on the affect of fuel shortages and higher fuel prices on the people of Ohio. The hearings are a part of an effort to assess the impact of the energy crisis on the American people. J.M.S.

N75-15160# Committee on Interior and Insular Affairs (U. S. Senate).
PROTOTYPE OIL SHALE LEASING PROGRAM
Washington GPO 1974 312 p refs Hearings before Subcomm. on Minerals, Materials and Fuels of Comm. on Interior and Insular Affairs, 93d Congr., 1st Sess., 17 Dec. 1973 and 5 Mar. 1974
(GPO-28-686) Avail: Subcomm. on Minerals, Materials and Fuels

The leasing program for commercial-scale oil production on public lands in Colorado, Utah, and Wyoming was analyzed. It was designed to provide information for determining whether 600 million barrel oil shale reserves can be developed at acceptable economic and environmental costs. Topics discussed include the economic impacts on the three states, shale oil capital, operating and resource costs, projected energy supply and demand, the projected amount of oil shale reserves, present energy costs and supplies, and potential energy sources. Alternatives to the prototype leasing program were evaluated along with the leasing procedures. M.J.S.

N75-15161*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COST AND SIZE ESTIMATES FOR AN ELECTROCHEMICAL BULK ENERGY STORAGE CONCEPT
Marvin Warshay and Lyle O. Wright Washington Feb. 1975 13 p refs
(NASA-TM-X-3192; E-8138) Avail: NTIS HC $3.25 CSCL 10C

Preliminary capital cost and size estimates were made for a titanium trichloride, titanium tetrachloride, ferric chloride, ferrous chloride redox-flow-cell electric power system. On the basis of these preliminary estimates plus other important considerations, this electrochemical system emerged as having great promise as a bulk energy storage system for power load leveling. The size of this system is less than two per cent of that of a comparable pumped hydroelectric plant. The estimated capital cost of a 10 MW, 60- and 85-MWh redox-flow system compared well with that of competing systems. Author

N75-15162*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CONDUCTIVITIES OF THE IONIC COMPLEXES OF TWO CYCLIC POLYETHERS
William L. Fielder and Patricia M. ODonnell Washington Jan. 1975 7 p refs
(NASA-TM-X-3188; E-8095) Avail: NTIS HC $3.25 CSCL 10A

The conductivities of the solid potassium thiocyanate complex of both dicyclohexyl-18-crown-6 and dibenzo-18-crown-6 were measured at 300K (27 C). Saturated aqueous potassium thiocyanate and graphite were used as ion-transporting and ion-blocking electrodes, respectively. The ionic conductivity predominated for both samples, but it was many orders of magnitude smaller than the value previously reported. The ionic conductivity of the dicyclohexyl complex (the better conductor) was 0.000003 ohm/cm. Crown complexes, in general, do not appear promising as potassium ion solid electrolytes contrary to claims in the patent literature. Author

N75-15163*# Arizona Univ., Tucson. Dept. of Electrical Engineering.
INVERSION LAYER SOLAR CELL FABRICATION AND EVALUATION
R. L. Call Jul. 1974 35 p Sponsored by NASA Prepared for JPL
(Contract JPL-953785)
(NASA-CR-141325) Avail: NTIS HC $3.75 CSCL 10A

Inversion layer solar cells have been fabricated by etching through the diffused layer on p-type silicon wafers in a comb-like contact pattern. The charge separation comes from an induced p-n junction at the surface. This inverted surface is caused by a layer of transparent material applied to the surface that either contains free positive ions or that creates donor states at the interface. Cells have increased from 3 ma Isc to 100 ma by application of sodium silicate. The action is unstable, however, and decays with time. Author

N75-15164*# TRW Systems Group, Redondo Beach, Calif.
A STUDY OF DEGRADATION OF PLATES FOR NICKEL-CADMIUM SPACECRAFT CELLS Final Report
Willard R. Scott Jun. 1974 151 p refs Prepared for JPL
(Contracts NAS7-100; JPL-953649)
(NASA-CR-141357; TRW-24118-6002-RU-00) Avail: NTIS HC $6.25 CSCL 10C

The relative merits of coining and not coining of sintered nickel oxide and cadmium plates was investigated. Sample plate materials from most commercial cell suppliers were obtained and characterized for properties that may correlate with the tendency toward physical disintegration during handling and over long periods of time in the cell. Special test methods were developed to obtain comparative data in a short time. A wide range of physical properties and coining thickness was observed, resulting in a range of responses. The stronger materials resisted loss of sinter better than weaker materials whether or not coined. Coining improved handling and resistance to electrochemical cycling of weaker materials. The mechanism of break-down of positive plate edges under cycling appears to be the same as that of thickening and blistering. Brittle, nonadherent sinter, resulting from certain impregnation processes, is the most vulnerable to degradation. It is concluded that the latter type of materials should be coined, but coining of strong materials is optional. Author

N75-15165# Gulf General Atomic, San Diego, Calif.
PROJECT DEVELOPMENT PLAN AND COST ESTIMATE, ERTG PROGRAM Final Report
5 Apr. 1974 22 p refs
(Contract AT(04-3)-943)
(GA-A-12915) Avail: NTIS HC $3.25 CSCL 10A

The economical radioisotope thermoelectric generator (ERTG) program assumes that the first flight generator will be launched during 1978. The program planned to meet this goal and the costs associated with the five phases of the program are presented. It is concluded that: The low cost RING converter can meet all system objectives using the existing technology of PbTe-PbSnMnTe/BiSbTe if the maximum heat source cost is $150/W (th); the low cost RING converter is a growth vehicle since the TPM alloys can be implemented in the converter with minimal impact, and this implementation will greatly lower cost and reduce size and weight; and the RING converter allows minimal constraints on the heat source development program. NSA

N75-15166# California Univ., Livermore. Lawrence Livermore Lab.
REVISED COST ESTIMATE FOR THE LLL IN SITU COAL GASIFICATION CONCEPT
D. R. Stephens 20 May 1974 35 p refs
(Contract W-7405-eng-48)
(UCRL-51578) Avail: NTIS HC $3.75

Cost estimates for the LLL in situ coal gasification concept using chemical explosive fracturing are revised. Gas selling prices are calculated using the utility financing method recommended by the Federal Power Commission Task Force. Conservatively, surface plant capital investment and annual operating cost are

estimated to be $221 million and $16.7 million, respectively, in 1974 dollars. Optimistically, the price is 21% per million Btu less than for the conservative case. These prices can be compared to surface processing estimates using the same procedures. There is a considerable potential cost advantage to in situ coal gasification using chemical explosive fracturing. Author (NSA)

N75-15167# Eagle-Picher Industries, Inc., Joplin, Mo. Couples Dept.
LITHIUM-CARBON MONOFLUORIDE ORGANIC ELECTROLYTE MANPACK BATTERY Final Report, Jun. 1972 - Jun 1974
Edward P. Broglio Aug. 1974 43 p
(Contract DAAB07-72-C-0204)
(AD-785732; ECOM-72-0204-F) Avail: NTIS CSCL 10/3

The purpose of this contract was to conduct research and development leading to the design and construction of a long-life, organic electrolyte battery for manpack equipment. The requirements cover a high energy density primary lithium battery capable of good low temperature performance at high power levels. GRA

N75-15168# Army Foreign Science and Technology Center, Charlottesville, Va.
WIND AND SOLAR POWER ENGINEERING
B. Konovalov 19 Apr. 1974 11 p Transl. into ENGLISH from Izv. (USSR), v. 273, 21 Nov. 1972 p 2
(AD-786844; FSTC-HT-23-0402-74) Avail: NTIS CSCL 10/1

The need for small wind and solar powered installations for use at small settlements and installations is briefly discussed. GRA

N75-15169# Pittsburg and Midway Coal Mining Co., Kansas City, Mo.
DEVELOPMENT OF A PROCESS FOR PRODUCING AN ASHLESS, LOW-SULFUR FUEL FROM COAL. VOLUME 2: LABORATORY STUDIES. PART 1: AUTOCLAVE EXPERIMENTS Interim Report
Charles H. Wright, Russell E. Perrussel, and Gerald R. Pastor Oct. 1974 335 p refs
(Contract DI-14-01-0001-496)
(PB-236305/9; CR-53-INT-6; IR-6) Avail: NTIS MF $2.25; SOD HC $4.10 as 163.10:53/Int. 6 CSCL 07A

The autoclave experiments and related laboratory studies done in support of the development of the pilot plant for preparation of solvent refined coal are summarized. These studies were done to obtain data for use in planning the pilot plant construction and operations and to assist in evaluating the commercial and economic feasibility of the solvent refined coal process. A considerable part of the work was devoted to evaluating various coals, solvents, and reducing gases that might be considered for further study in the pilot plant. Author (GRA)

N75-15170# EIC, Inc., Newton, Mass.
LITHIUM: INORGANIC ELECTROLYTE BATTERIES Quarterly Report, 16 Mar. - 15 Jun. 1974
David R. Cogley, Michael J. Turchan, and G. L. Holleck Sep. 1974 49 p refs
(Contract DAAB07-74-C-0030; DA Proj. 1T1-61102-A-34A)
(AD-786673; C-401-3; ECOM-74-0030-3; QR-3) Avail: NTIS CSCL 10/3

An all-inorganic electrolyte, lithium primary battery operable over the temperature range -40 to +160F is being evaluated. The desired energy density is 150 watt-hours per pound of total battery weight and the desired power density is 50 watts per pound. Severe Li electrode polarization was observed in experimental cells after one week's storage at 160F. Li electrode corrosion was more severe in stainless steel cells than under high purity conditions in glass containers. Potential scans on Ni, stainless steel, and C show that SOCl2 reduction is a complex, potential-dependent process. Carbon is the best catalyst for SOCl2 reduction at anodic potentials. In the passive region, significant cathodic currents are observed on carbon below 1 V. The major part of the films formed is LiCl. Sulfur is a reaction product of Li/SOCl2 cells. At -40F, cell voltage is limited by the carbon electrode. (Modified author abstract) GRA

N75-15171# Bureau of Mines, Washington, D.C.
BUREAU OF MINES RESEARCH 1973. SUMMARY OF SIGNIFICANT RESULTS IN MINING, METALLURGY, AND ENERGY
Jul. 1974 114 p refs
(PB-234733/4; BM-SP-1-74) Avail: NTIS MF $2.25; SOD HC $1.25 CSCL 08I

Results of scientific and engineering investigations in developing technology for extracting, processing, and recycling minerals, metals, and fossil fuels are summarized. Various aspects of coal, oil shale, and petroleum research are covered, along with mineral processing; hydrometallurgy; pyrometallurgy; secondary resource recovery; metallic and nonmetallic materials; and mine safety. A directory of mining, metallurgy, energy, and mineral supply research centers is included with a list of recent publications. Author (GRA)

N75-15172# Bureau of Mines, Morgantown, W.Va. Energy Research Center.
BUREAU OF MINES ENERGY PROGRAM, 1973
John D. Spencer and Bill Linville Jul. 1974 82 p refs
(PB-234682/3; BM-IC-8651) Avail: NTIS HC $4.75 CSCL 21D

New and improved methods for the discovery and production of oil and gas and production of fluid fuels from coal continued to be the major thrust of the Bureau of Mines energy research program during 1973. Crude oil recovery from tar sands and oil shale also retained a high priority in this work. Complementing this program were numerous studies aimed at accomplishing the objective of increased energy output with greater safety and minimum harm to the natural environment. This report summarizes research objectives and results and itemizes formal publications of the Bureau of Mines on energy and related subjects. GRA

N75-15173# FMC Corp., Princeton, N.J. Chemical Research and Development Center.
CHAR OIL ENERGY DEVELOPMENT Interim Report, Jul. 1972 - Jun. 1973
L. J. Scotti, B. D. McMunn, M. I. Greene, R. C. Merrill, and F. H. Schoemann Apr. 1974 231 p
(Contract DI-14-32-0001-1212)
(PB-234018/0; OCR-73-INT-2) Avail: NTIS MF $2.25; SOD HC $2.35 as I63:10:73/INT2 CSCL 07A

Descriptors: Coal gasification, Bituminous coal, Manufactured gas, Crude Oil, Pyrolysis, Pilot plants, Hydrogenation, Electric power generation, Fluidized bed processing, Boiler fuels, Desulfurization, Liquefaction. Indentifiers: Coal liquefaction, Coed process, Chars. Operations of the COED (Char-Oil-Energy-Development) pilot plant at Princeton, N. J., from July 1972 to June 30, 1973, are discussed. Report covers pyrolysis, oil filtration, hydrotreating, materials of construction, and commercial design studies. GRA

N75-15174# Federal Power Commission, Washington, D.C. Bureau of Natural Gas.
OFFSHORE INVESTIGATION: PRODUCIBLE SHUT-IN LEASES AS OF JANUARY 1974 (SECOND PHASE)
Jul. 1974 28 p refs
(PB-234490/1) Avail: NTIS HC $3.75 CSCL 08I

Reserve estimates were made for each of the 168 leases classified by the U.S. Geological Survey (USGS) as producible shut-in as of January 22, 1974. Data available in the USGS files were used for estimating the gas reserves of 142 of the leases while reserve estimates for the remaining 26 leases were available in the records of the Federal Power Commission (FPC). The results of these reserve estimates are summarized. Author (GRA)

N75-15175# Ford Motor Co., Dearborn, Mich. Scientific Research Staff.
RESEARCH ON ELECTRODES AND ELECTROLYTE FOR THE FORD SODIUM-SULFUR BATTERY Quarterly Report, 1 Jan. - 31 Mar. 1974
Apr. 1974 112 p refs
(Contract NSF C-805)
(PB-234561/9; NSF/RA/N-74-039) Avail: NTIS HC $5.25 CSCL 10C

Research findings on, (1) the sintering procedures for beta bata bouble prime-alumina ceramics, (2) the dependence of strength and resistivity on ceramic composition, (3) the extrusion of ceramic and (4) the effect(s) of isostatic pressing parameters, both wet and dry bag, on the green and sintered densities are reported. In the sulfur electrode development program, work is progressing in all areas. The laser-Raman facilities were modified to establish a temperature capability up to 500C. Analyses of failed cells indicate the presence of iron in the melt and the attack of the graphite felt. The kinetic study in polysulfide melts has led to a tentative identification of the limiting reactions. Molybdenum was retested and found to corrode badly in sodium tetrasulfide. (Modified author abstract) GRA

N75-15176# Kentucky Univ., Lexington. Dept. of Chemical Engineering.
SYNTHETIC OIL FROM COAL Biannual Report, 1 Oct. 1973 - 31 Mar. 1974
Richard L. Kermode Jul. 1974 62 p refs Sponsored in part by NSF
(Proj. NSF/RANN)
(PB-234460/4; UKY-TR86-74-CME2) Avail: NTIS HC $4.25 CSCL 21D

A progress report is presented on the study of liquefaction of coal by hydrogenation. Projects studied include: variables associated with hydrogen production to identify those areas in which technical success is most likely to improve the overall economics of coal liquefaction, a solids separation study of flotation as a means of removing unconverted coal and ash from coal liquids, a low temperature carbonization process as a source for suitable refinery feedstock and char feedstock for a hydrogen plant, a systematic laboratory investigation to identify trace elements, and minerals detrimental to catalytic hydrogenation of coal. GRA

N75-15177# Mitre Corp., McLean, Va.
PROGRAM PLAN FOR ENVIRONMENTAL EFFECTS OF ENERGY Final Report, 15 May - 31 Jul. 1974
Robert P. Pikul and Robert Rabin Jul. 1974 309 p refs Sponsored by NSF
(PB-235115/3; MTR-6726) Avail: NTIS HC $9.25 CSCL 10A

The National Science Foundation's initial five year program plan for the environmental effects of energy is presented. A basic program for five energy sources (coal, oil and gas, oil shale, geothermal, and solar) is described. Preobligated projects, new environmental support studies, and program planning and evaluation needs are identified. Author (GRA)

N75-15178# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
INTERFUEL SUBSTITUTION IN THE CONSUMPTION OF ENERGY IN THE UNITED STATES. PART 1: RESIDENTIAL AND COMMERCIAL SECTOR Interim Report
Martin L. Baughman, Paul L. Joskow, and Frederick S. Zerhoot 25 May 1974 97 p refs
(Grant NSF GI-39151)
(PB-234536/1; MIT-EL-74-002) Avail: NTIS HC $4.75 CSCL 21D

A conceptual model used for fuel choice decisions is given and empirical results presented for appliance choices in the residential sector for four selected appliances and for the fuel split of aggregate energy consumption among three fuels. Determinants of total energy demand in the residential and commercial sectors are covered along with a simple flow adjustment model. Estimated relationships are used to make projections to 1980 for alternative price scenarios. GRA

N75-15179# California Inst. of Tech., Pasadena.
CALTECH SEMINAR SERIES ON ENERGY CONSUMPTION IN PRIVATE TRANSPORTATION Final Report, 1 Jul. 1973 - 30 Jun. 1974
John R. Pierce 30 Jun. 1974 330 p refs
(Contract DOT-OS-30119)
(PB-235348/0; DOT-TST-75-7) Avail: NTIS HC $7.50 CSCL 21D

Data, concerned primarily with means of reducing the huge amount of valuable oil burned in private cars are reported. Topics discussed include means to produce vehicles that have: lower weight with adequate space and safety, efficient, low pollution engines, better suspension and lower-loss tires, reduced power loss in accessories at high speeds, reduced air drag, more efficient transmission, and efficient operation with a shorter warmup period. Other courses discussed that could have a useful effect on oil consumption in the near future are: computerized traffic control, carpools, vanpools, and computer buses, demand-responsive transit, and improved fixed-route transit. Hybrid cars, electric cars, personal rapid transit, telecommunications, and legislative changes in the field of taxation are covered. GRA

N75-15180# Boston Coll., Chestnut Hill, Mass. Dept. of Physics.
POLYCRYSTALLINE SILICONE SOLAR CELLS FOR ECONOMICAL AND ECOLOGICAL ELECTRICAL POWER SYSTEMS Annual Progress Report, 1 Jan. - 31 Dec. 1973
P. H. Fang 31 Jan. 1974 66 p refs
(Grant NSF GI-34975)
(PB-235466/0; NSF/RANN/SE/GI-37975/73/4; NSF/RA/N-74-054) Avail: NTIS HC $4.25 CSCL 10A

A new solar cell structure to convert solar energy into electrical energy for terrestrial application is discussed. Various substrate materials for growing polycrystalline silicon films of one of ten micrometers thick by evaporation and chemical vapor deposition methods are investigated. Report discusses growth of silicon on titanium which is coated on the substrate to prevent diffusion of substrate material into silicon and to provide good electrical contact. GRA

N75-15181# Maryland Univ., College Park. Dept. of Mechanical Engineering.
OPTIMIZATION STUDY OF SOLAR ABSORPTION AIR CONDITIONING SYSTEMS Semiannual Progress Report, 15 Aug. 1973 - 15 Feb. 1974
R. W. Allen May 1974 78 p refs
(Grant NSF GI-39117)
(PB-235490/0; NSF/RA/N-74-049; NSF/RANN/SE/GI-39117/74/1) Avail: NTIS HC $4.75 CSCL 13A

The effect of system options and actual process factors on performance and optimization of a solar powered absorption air-conditioning system, was studied. Thermodynamic analysis of the basis and the modified absorption cycle incorporating a liquid-liquid heat exchanger was completed for the commercial absorption air-conditioning pairs lithium bromide-water ammonia-water. GRA

N75-15182# Texas Instruments, Inc., Dallas.
DEVELOPMENT OF LOW-COST THIN FILM POLYCRYSTALLINE SILICON SOLAR CELLS FOR TERRESTRIAL APPLICATIONS Semiannual Progress Report, 1 Jan. - 30 Jun. 1974
Ting L. Chu Jul. 1974 59 p refs
(Grant NSF GI-38981)
(PB-235467/8; NSF/RANN/SE/GI-38981/PR/74/2; NSF/RA/N-74-069) Avail: NTIS HC $4.25 CSCL 10B

Polycrystalline silicon solar cell structures were deposited on USS Vitrenamel 1 (a low carbon steel), graphite, and metallurgical-grade silicon substrates by the thermal decomposition of silane and appropriate dopants. P-n junction and Schottky barrier solar cells fabricated from silicon/borosilicate/USS Vitrenamel 1 structures (borosilicate is used as a diffusion barrier) have very low conversion efficiencies. P-n junction solar cells on graphite substrates of 2.5 cm x 2.5 cm area have AMO efficiencies of up to 1.5 percent. This type of solar cell is very promising because of the simplicity in fabrication, and a substantial improvement in efficiency is believed to be attainable by optimizing the structure of silicon. P-n junction solar cells on metallurgical silicon substrates with efficiencies up to 2.2 percent were obtained. GRA

N75-15183# Illinois Univ., Urbana. Dept. of Civil Engineering.
BIOLOGICAL CONVERSION OF ORGANIC REFUSE TO METHANE Annual Progress Report, 1 Jul. 1973 - 30 Jun. 1974
John T. Pfeffer and Jon C. Liebman Jul. 1974 182 p refs
(Grant NSF GI-39191)

(PB-235468/6; UILU-ENG-74-2019; NSF/RANN/SE/GI-39191/PR/74/2; NSF/RA/N-74-068) Avail: NTIS HC $7.00 CSCL 10A

Urban solid wastes contain significant quantities of energy that can be reclaimed. Biological conversion of the organic refuse to methane by anaerobic fermentation is one mechanism by which this energy can be reclaimed. The results of an investigation of refuse fermentation at a thermophilic operating temperature of 60 C are reported. Results of dewatering of the fermentor residue by vacuum filtration and centrifugation are presented. A mathematical simulator of the fermentation process, vacuum filtration process, shredding and separation process, and residue disposal processes is constructed. Results from the simulator runs are given. GRA

N75-15184# California Inst. of Tech., Pasadena.
CALTECH SEMINAR SERIES ON ENERGY CONSUMPTION IN PRIVATE TRANSPORTATION: ADMINISTRATIVE SUMMARY Final Report, 1 Jul. 1973 - 30 Jun. 1974
Albert R. Hibbs 30 Jun. 1974 30 p refs
(Contract DOT-OS-30119)
(PB-235349/8; DOT-TST-75-6) Avail: NTIS HC $3.75 CSCL 21D

A brief summary of organizational and administrative actions covering the preparation for and conduct of the seminar series, together with a brief commentary on the whole operation and an analysis of results is presented. Author (GRA)

N75-15185# Arizona Univ., Tucson. Optical Sciences Center.
CHEMICAL VAPOR DEPOSITION RESEARCH FOR FABRICATION OF SOLAR ENERGY CONVERTORS Quarterly Progress Report, 1 Jan. - 31 Mar. 1974
B. O. Seraphin 30 Apr. 1974 47 p refs
(Grant NSF GI-36731)
(PB-235481/9; NSF/RANN/SE/GI-36731X/PR/74/1; NSF/RA/N-74-004) Avail: NTIS HC $3.75 CSCL 13H

The project will support research on a new approach to a selective solar energy convertor that can be used to transform solar radiation into high temperature heat. The selective solar energy convertor is basically a two-layered construction in which the top layer is a semiconductor material, such as silicon, having high absorption for solar radiation and high transparency for blackbody radiation from the heated unit. The bottom layer is a metal film having high reflectance. Author (GRA)

N75-15186# Arizona Univ., Tucson. Optical Sciences Center.
RESEARCH APPLIED TO SOLAR-THERMAL POWER SYSTEMS: CHEMICAL VAPOR DEPOSITION RESEARCH FOR FABRICATION OF SOLAR ENERGY CONVERTORS Annual Progress Report, 1 Jan. - 31 Dec. 1973
B. O. Seraphin 31 Dec. 1973 95 p refs
(Grant NSF GI-36371)
(PB-234565/0; NSF/RA/N-74-004) Avail: NTIS HC $4.75 CSCL 10B

The project supports research on a new approach to a selective solar energy convertor that can be used to transform solar radiation into high temperature heat. This heat can be transferred and applied in a steam turbin-generator unit to produce electricity. The selective solar energy convertor is basically a two-layered construction in which the top layer is a semiconductor material, such as silicon, having high absorption for solar radiation and high transparency for blackbody radiation from the heated unit. The bottom layer is a metal film having high reflectance. Author (GRA)

N75-15187# Exxon Research and Engineering Co., Linden, N.J.

FEASIBILITY STUDY OF ALTERNATIVE FUELS FOR AUTOMOTIVE TRANSPORTATION. VOLUME 1: EXECUTIVE SUMMARY
F. H. Kant, R. P. Cahn, A. R. Cunningham, M. H. Farmer, and W. Herbst Jun. 1974 29 p
(Contract EPA-68-01-2112)
(PB-235581/6; EPA-460/3-74-009-a-Vol-1) Avail: NTIS HC $3.75 HC also available from NTIS $16.50/set of 3 reports as PB-235580-SET CSCL 13B

Highlights of a study dealing with alternative liquid fuels derived from domestic coal and oil shale are discussed. Economic technical, and performance criteria are considered for gasolines, distillates, and methanol for the time period 1975-2000. Estimated cost for producing the fuels is covered as well as safety, toxicity, reliability, compatibility with various engines, and convenience of use. Author

N75-15188# Exxon Research and Engineering Co., Linden, N.J.

FEASIBILITY STUDY OF ALTERNATIVE FUELS FOR AUTOMOTIVE TRANSPORTATION. VOLUME 2: TECHNICAL SECTION
F. H. Kant, R. P. Cahn, A. R. Cunningham, M. H. Farmer, and W. Herbst Jun. 1974 238 p refs
(Contract EPA-68-01-2112)
(PB-235582/4; EPA-460/3-74-009-b-Vol-2) Avail: NTIS HC $7.50 HC also available from NTIS $16.50/set of 3 reports as PB-235580-SET CSCL 13B

Feasible and practical alternatives are identified to automotive fuels derived from petroleum for the 1975-2000 time period. The alternative fuels are liquids derived from domestic coal and oil shale -- specifically, gasolines, distillates, and methanol. Fuels were screened on the basis of economic, technical, and performance criteria, with consideration given to the way in which each fuel could be brought into general use. Consideration was given to the environmental impact of producing and using the fuels. Feasible and practical alternative automotive fuels were identified and gasoline-type and distillate-type fuels from oil shale together with gasoline-type, distillate-type, and methanol fuels from coal were evaluated in detail. Safety, toxicity, reliability, compatibility with different engines, and covenience of use were considered. GRA

N75-15189# Exxon Research and Engineering Co., Linden, N. J.
FEASIBILITY STUDY OF ALTERNATIVE FUELS AND AUTOMOTIVE TRANSPORTATION. VOLUME 3: APPENDICES
F. H. Kant, R. P. Cahn, A. R. Cunningham, M. H. Farmer, and W. Herbst Jun. 1974 143 p refs
(Contract EPA-68-01-2112)
(PB-235583/2; EPA-460/3-74-009-c-Vol-3) Avail: NTIS HC $5.75 HC also available from NTIS $16.50/set of 3 reports as PB-235580-SET CSCL 13B

Supplementary material for some of the topics discussed in Volume 2 is presented. The titles are as follows: background considerations; transportation fuel demand; resource base information; possible approach of other countries to alternative transportation fuels; build-up of synthetic fuels manufacturing capacity; significance of fuel properties; bases for capital recovery; refining of shale and coal syncrude; coal mining costs and investments; and cost of operating and automobile. GRA

N75-15190# TRW Systems Group, Redondo Beach, Calif.
SOLAR HEATING AND COOLING OF BUILDINGS, PHASE O. VOLUME 2: FINAL REPORT Final Report
31 May 1974 534 p refs
(Contract NSF C-853)
(PB-235423/1; TRW-25168.002; NSF/RA/N-74-002B) Avail: NTIS HC $12.50 HC also available from NTIS $20.00/set of 3 reports as PB-235421-SET CSCL 13A

Functional performance, and operational requirements for solar water heating, space heating, and cooling systems for a range of building types in various climatic regions of the U.S. are established. The report assesses market capture potential for solar heating/cooling applications and identifies cost-effective system/building/region combinations. Social and environmental impacts are considered along with projected first costs, present value, and equivalent costs (including operation and maintenance costs). GRA

N75-15191# General Electric Co., Philadelphia, Pa. Space Div.
SOLAR HEATING AND COOLING OF BUILDINGS, PHASE O: FEASIBILITY AND PLANNING STUDY. VOLUME 3, BOOK 1, APPENDIX A, TASK 1: DEVELOPMENT OF REQUIREMENTS. APPENDIX B, TASK 2: SYSTEMS DEFINITION Final Report
May 1974 354 p refs

(Contract NSFC-855)
(PB-235433/0; DOC-74SD4219-Vol-3-Bk-1; NSF/RA/N-74-021C) Avail: NTIS HC $10.00 HC also available from NTIS $45.00/set of 5 reports as PB-235430-SET CSCL 13A

Appendices to the study of solar heating and cooling of buildings are presented. The development is reported of requirements and a collector solar flux computer program, a preliminary solar heating and cooling screening model, a peak design loads computation program, and building parameters used to develop heating and cooling loads. Systems definition, including descriptions of models for heat pumps, solar absorption cooling systems, solar Rankine systems, nocturnal cooling, solar collector simulation, skytherm heating and cooling systems, and collector performance are described. Also discussed are thermal energy storage, heat recovery HVAC systems, on-going research pertinent to solar heating and cooling of buildings, system performance data plots, and climatological optimization of solar collectors. GRA

N75-15192# Westinghouse Electric Corp., Baltimore, Md. Special Systems.
SOLAR HEATING AND COOLING OF BUILDINGS. PHASE 0: FINAL REPORT, VOLUME 1 Final Report, Oct. 1973 - May 1974
May 1974 361 p refs
(Contract NSF C-854)
(PB-235427/2; W-DESC-SS-10275-1; NSF/RA/N-74-023B) Avail: NTIS HC $10.00 HC also available from NTIS $25.00/set of 4 reports as PB-235425-SET CSCL 13A

A comprehensive analysis was made of technical, economic, social, environmental and institutional factors affecting the feasibility of using solar energy for heating and cooling buildings. Solar heating and cooling systems can become competitive in most regions of the country in the 1985-1990 period. Heating-only systems can be competitive in the 1975-1980 period in limited regions of the country. Impressive progress has recently been made in solar collectors but further reduction in costs is necessary to capture a large market. Five regions of the country containing more than 75 percent of the population have been identified as the market for solar systems. The amount of fossil fuel that can be saved by use of solar energy will build up slowly and could reach 50 million barrels of oil per year by 1990. GRA

N75-15193# Westinghouse Electric Corp., Baltimore, Md. Special Systems.
SOLAR HEATING AND COOLING OF BUILDINGS. PHASE 0: FINAL REPORT. VOLUME 2: APPENDICES A-N Final Report, Oct. 1973 - May 1974
May 1974 400 p refs
(Contract NSF C-854)
(PB-235428/0; W-DESC-SS-10275-2; NSF/RA/N-74-023C) Avail: NTIS HC $10.25 HC also available from NTIS $25.00/set of 4 reports as PB-235425-SET CSCL 13A

Appendices are presented to a study of the technical, economic, social, environmental, and institutional factors affecting the feasibility of using solar energy for heating and cooling of buildings. Titles of the appendices are: Building and usage selection; solar collector and solar heating/cooling; future fuel prices; Westinghouse building code; changes in standard building practice, insulation and materials, structures; thermal and noise comfort in buildings; residential and nonresidential building design; reliability and maintainability; safety and code aspects for solar systems; solar cooling by adsorption air-conditioners; informational material development; control requirements; a state-of-the-art review of solar heating and cooling systems and subsystems; and absorption air-conditioning. For Vol. 1, see N75-15192. GRA

N75-15194# Westinghouse Electric Corp., Baltimore, Md. Special Systems.
SOLAR HEATING AND COOLING OF BUILDINGS. PHASE 0: FINAL REPORT. VOLUME 3: APPENDICES O-Y Final Report, Oct. 1973 - May 1974
May 1974 412 p refs
(Contract NSF C-854)
(PB-235429/8; W-DESC-SS-10275-3; NSF/RA/N-74-023D) Avail: NTIS HC $10.50 HC also available from NTIS $25.00/set of 4 reports as PB-235425-SET CSCL 13A

This volume contains 11 appendices to a study of the technical, economic, social, environmental, and institutional factors affecting the feasibility of using solar energy for heating and cooling of buildings. Appendices include: Computer evaluation program: structure and fuel price projections; questionnaires delineation of constraints, and acceptability of systems; tables of results: delineation of constraints, and acceptability of systems; economic analysis and data; specification for preliminary design; competitive strengths and disadvantages of solar versus conventional systems; key market and institutional barriers; and preliminary identification of government policy and incentive actions. GRA

N75-15195# Westinghouse Electric Corp., Baltimore, Md. Special Systems.
SOLAR HEATING AND COOLING OF BUILDINGS. PHASE 0: FINAL REPORT. EXECUTIVE SUMMARY
May 1974 68 p
(Contract NSF C-84)
(PB-235426/4; W-DSC-SS-10275-4; NSF/RA/N-74-023A) Avail: NTIS HC $4.25 HC also available from NTIS $25.00/set of 4 reports as PB-235425-SET also available from NTIS $9.00/set of 3 executive summaries as PB-235420 CSCL 13A

Results of a comprehensive analysis of the technical, economic, social, environmental, and institutional factors affecting the feasibility of using solar energy for heating and cooling systems are summarized. Results indicate that solar heating and cooling could become economically competitive in most regions of the country in the 1985-1990 period. Author (GRA)

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N75-15196 Central Electricity Generating Board, London (England).
TECHNICAL GUIDE TO CLEAN AIR
1974 16 p Transl. into ENGLISH from VIK Mitteilungen, no. 1, 1974 p 26-30
(CE-Trans-6506) Avail: Issuing Activity

Objections of the German electric power industry to specified government-proposed air pollution control policies are presented. N.E.R.

N75-15197*# Stanford Univ., Calif. Mechanical Engineering Dept.
DECOMPOSITION OF NO STUDIED BY INFRARED EMISSION AND CO LASER ABSORPTION
R. K. Hanson, W. L. Flower, J. P. Monat, and C. H. Kruger [1974] 4 p refs Sponsored by NASA
(NASA-CR-141275) Avail: NTIS HC $3.25 CSCL 13B

A diagnostic technique for monitoring the concentration of NO using absorption of CO laser radiation was developed and applied in a study of the decomposition kinetics of NO. Simultaneous measurements of infrared emission by NO at 5.3 microns were also made to validate the laser absorption technique. The data were obtained behind incindent shocks in NO-N2O-Ar (or Kr) mixtures, with temperatures in the range 2400-4100 K. Rate constants for dominant reactions were inferred from comparisons with computer simulations of the reactive flow. Author

N75-15198# National Aviation Facilities Experimental Center, Atlantic City, N.J.
COMPARISON OF EXHAUST EMISSIONS OF A LOW-TIME JT8D-11 ENGINE: HIGH-SMOKE VERSUS LOW-SMOKE COMBUSTION CHAMBER CONFIGURATIONS Final Report, Jul. 1972 - Dec. 1973
Stephen L. Imbrogno and Thomas Rust, Jr. Apr. 1974 29 p refs
(AD-780958; FAA-NA-74-6; FAA-RD-74-87) Avail: NTIS HC $3.25

Engine-core exhaust emissions were measured on a low-time JT8D-11 engine in both high-smoke and low-smoke configurations. Changing from the high-smoke to the low-smoke configuration considerably reduced the visible smoke, 55 to 90 percent. Carbon monoxide was reduced by up to 40 percent. Total unburned hydrocarbons were reduced by 40 percent at idle power, while the production of oxides of nitrogen was increased by 60 percent at the high power setting. These percentages are absolute with no consideration for time in mode. Author

N75-15199*# Miami Univ., Coral Gables, Fla. Dept. of Mechanical and Industrial Engineering.
FEASIBILITY OF REMOTE SENSING FOR DETECTING THERMAL POLLUTION. PART 1: FEASIBILITY STUDY. PART 2: IMPLEMENTATION PLAN
T. Nejat Veziroglu and Samuel S. Lee Dec. 1973 184 p refs (Contract NAS10-8402)
(NASA-CR-134453) Avail: NTIS HC $7.00 CSCL 13B

A feasibility study for the development of a three-dimensional generalized, predictive, analytical model involving remote sensing, in-situ measurements, and an active system to remotely measure turbidity is presented. An implementation plan for the development of the three-dimensional model and for the application of remote sensing of temperature and turbidity measurements is outlined. J.M.S.

N75-15200*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
POLLUTION EMISSIONS FROM SINGLE SWIRL-CAN COMBUSTOR MODULES AT PARAMETRIC TEST CONDITIONS
Edward J. Mularz, Jerrold D. Wear, and Peter W. Verbulecz Washington Jan. 1975 36 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Cleveland
(NASA-TM-X-3167; E-8017) Avail: NTIS HC $3.75 CSCL 13B

Exhaust pollutant emissions were measured from single swirl-can combustor modules operating over a pressure range of 69 to 276 N/sq cm (100 to 400 psia), over a fuel-air ratio range of 0.01 to 0.04, at an inlet air temperature of 733 K (860 F), and at a constant reference velocity of 23.2 m/sec). Many swirl-can module designs were evaluated; the 11 most promising designs exhibited oxides of nitrogen emission levels lower than that from conventional gas-turbine combustors. Although these single module test results are not necessarily indicative of the performance characteristics of a large array of modules, the results are very promixing and offer a number of module designs that should be tested in a full combustor. Author

N75-15201*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PERFORMANCE AND POLLUTION MEASUREMENTS OF TWO-ROW SWIRL-CAN COMBUSTOR HAVING 72 MODULES
James A. Bigalow and Arthur M. Trout Washington Jan. 1975 29 p refs
(NASA-TM-X-3170; E-8068) Avail: NTIS HC $3.75 CSCL 13B

A test program was conducted to evaluate the performance and gaseous-pollutant levels of an experimental full-annulus 72-module swirl-can combustor. A comparison of data with those for a 120-module swirl-can combustor showed no significant difference in performance or levels of gaseous pollutants. Oxides of nitrogen were correlated for the 72- and 120-swirl-can combustors by using a previously developed parameter. Author

N75-15202# California Univ., Livermore. Lawrence Livermore Lab.
ATMOSPHERIC RELEASE ADVISORY CAPABILITY: RESEARCH AND PROGRESS
J. B. Knox and T. V. Crawford 8 May 1974 33 p refs Presented at 2d AEC Pollution Control Conf., Albuquerque, New Mexico, 16 Apr. 1974 Revised
(UCRL-75644-Rev-2; Conf-740406-16) Avail: NTIS HC $3.75

The purpose of the Atmospheric release advisory capability is to provide for real-time predictions of effects and dose-to-man of atmospheric releases of hazardous materials as rapidly and accurately as possible, to provide environmental surveillance and monitoring information in real-time, and to provide regional transport modeling capabilities. Planned technical milestones are given. NSA

N75-15203# Bureau of Mines, Washington, D.C.
BUREAU OF MINES RESEARCH PROGRAMS ON RECYCLING AND DISPOSAL OF MINERAL, METAL, AND ENERGY-BASED WASTES
C. B. Kenahan, R. S. Kaplan, J. T. Dunham, and D. G. Linnehan 1973 60 p refs
(PB-227476/9; BM-IC-8595) Avail: NTIS HC $4.25 CSCL 08I

A summary of Bureau of Mines research on utilization and disposal of solid wastes is presented, accompanied by an extensive bibliography of related publications. The Bureau's Solid Waste and Materials Recycling Program is directed toward four main areas of research, development, and demonstration: (1) extraction of mineral, metal, and energy values from urban refuse; (2) upgrading and recycling of automotive and related ferrous and nonferrous scrap; (3) utilization and stabilization of mine, mill, and smelter wastes; and (4) recovery and reuse of values from industrial waste products. GRA

N75-15204# Coast Guard Research and Development Center, Groton, Conn.
A TECHNIQUE FOR PREDICTING THE MOVEMENT OF OIL SPILLS IN NEW YORK HARBOR Final Report
Ivan M. Lissauer Feb. 1974 58 p refs
(CG Proj. 744244)
(AD-786627; CGR/DC-8/74; USCG-D-6-75) Avail: NTIS CSCL 13/2

Contents: New York Harbor experiments; Factors determining the movement of oil spills; Potential oil pollution sites - Upper New York Bay. GRA

N75-15205# School of Aerospace Medicine, Brooks AFB, Tex.
DETERMINATION OF POLYCYCLIC AROMATIC HYDROCARBONS IN THE AIR OF COAL TAR PROCESSING PREMISES
A. S. Filotova, A. I. Kuzminykh, and V. B. Kapitulskii 1974 8 p refs Transl. into ENGLISH from Gig. Tr. Prof. Zabol. (USSR), v. 17, May 1973 p 49-52
(AD-786343; SAM-TT-R-1216) Avail: NTIS CSCL 07/3

The report concerns polycyclic aromatic hydrocarbons in the air of coal tar processing plants. Separation and analysis by spectral fluorescence and spectrophotometry are briefly described. GRA

N75-15206# Harbridge House, Inc., Boston, Mass.
KEY LAND USE ISSUES FACING EPA
Feb. 1974 381 p refs Sponsored by EPA
(PB-235345/6; EPA-230/3-74-011) Avail: NTIS HC $10.25 CSCL 13B

Key land use issues facing EPA are identified and analyzed in terms of the environmental impacts involved and the projected magnitude of the problems over time. The need to view land use in terms of an intermedia perspective is emphasized. A preliminary analysis is made of broad land use categories, i.e., agriculture, mining silviculture, transportation, energy facilities, and residential, commercial and industrial usage. Land use issues are divided into two subdivisions: General growth pattern and the siting of key facilities. Each of the major land uses is viewed in terms of impact on air, water, and noise pollution levels, and indirect effects such as induced development on surrounding land. GRA

N75-15207# Naval Research Lab., Washington, D.C.
DETERMINATION OF THE THICKNESS OF PETROLEUM FILMS ON WATER Final Report
William R. Barger, David R. Sherard, and William D. Garrett Aug. 1974 18 p refs
(AD-786353; NRL-MR-2883) Avail: NTIS CSCL 14/2

Two devices have been developed to determine the thickness of petroleum films on water. Both techniques use oil collectors which quantitatively remove the oil layer from a known surface area. The devices are weighed before and after being placed on

the oil-covered water, and a small correction factor for entrained water is applied to the calculation of oil layer thickness. Recticulated, polyurethane foam discs are mounted in an open-ended cylinder to form a floating oleophilic sponge. When placed on the water, oil is absorbed within the confined cylindrical area. The second collector, a hydrophilic Teflon sheet, removes thin layers of oil from water upon contact. Because of its chemically inert character, the hydrophilic Teflon collector is useful for sampling spills for chemical identification and analyses. (Modified author abstract) GRA

N75-15208# Atomics International, Canoga Park, Calif.
DIESEL EXHAUST EMISSION CONTROL PROGRAM Final Report, Jul. 1972 - Jan. 1974
S. Sudar Jan. 1974 142 p refs Sponsored by Urban Mass Transp. Adm.
(PB-234752/4; AI-73-61; UMTA-CA-06-0035-74-1) Avail: NTIS HC $5.75 CSCL 13B

The development and demonstration of a prototype diesel engine exhaust emission control system for urban buses is described. The system design concept is based upon catalytic oxidation of hydrocarbons, carbon monoxide, and odorous oxygenated organic compounds. NOx removal is based upon catalytic oxidation of nitric oxide to nitrogen dioxide and subsequent absorption of NO2 in an alkaline molten carbonate salt scrubber. The system was demonstrated in an SCRTD city bus equipped with a Detroit Diesel 6V-71N 2-stroke engine. Performance data and specifications are included. GRA

N75-15209# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
FEASIBILITY OF FUEL SWITCHING IN BOSTON Final Report
David P. Hoult and William T. Kranz Feb. 1974 73 p refs
(PB-234535/3; MIT-EL-74-001) Avail: NTIS HC $4.25 CSCL 04A

A simple physical model is developed that predicts that the nighttime dispersion of SO2 from the largest sources in Boston is different than the dispersion of SO2rom small, low level sources. Diurnal variations in SO2 levels measured in Boston over the last seven years are analyzed in the light of this theory. The relationship between the urban heat island and nighttime diffusion is examined and a simple, unambiguous criterion for defining a large source is developed. The results are used to predict the fraction of the time large sources could burn high sulfur fuels while still meeting the state standards for sulfur dioxide. GRA

N75-15210# Aerospace Corp., Los Angeles, Calif. Electronics Research Lab.
NO2 MEASURING SYSTEM Final Report
M. Birnbaum and A. W. Tucker May 1974 36 p refs
(Contract EPA-68-02-1225)
(PB-234225/1; EPA-650/2-73-059) Avail: NTIS HC $3.75 CSCL 14B

The construction and operation of the laser NO2 monitor prototype are described in this report. A He-Cd laser was used for excitation. A new type of low fluorescence solution filter was developed which resulted in greatly improved sensitivity. Saturated water vapor levels did not result in any detectable interference. The response of the instrument with respect to concentration of NO2 was found to be strictly linear over the range tested, 10 to 1000 ppby. Measurements of the ambient NO2 levels in the atmosphere in the vicinity of the laboratory building showed a highly satisfactory performance of the instrument. GRA

N75-15211# Purdue Univ., Lafayette, Ind. Water Resources Research Center.
APPLICATION OF STATISTICAL TECHNIQUES TO THE SELECTION OF AN OPTIMAL POLLUTION TREATMENT PROGRAM Technical Report, 1 Jul. 1971 - 30 Jun. 1974
A. B. Whinston, J. R. Marsden, and D. E. Pingry Jun. 1974 126 p refs Sponsored by the Dept. of the Interior
(PB-235327/4; TR-51; W74-11570; OWRR-A-024-IND(8)) Avail: NTIS HC $5.75 CSCL 06F

Application of statistical and related techniques to the selection of an optimal pollution treatment system is considered. The work attempts to develop several techniques which can be used in analyzing data obtained from waste treatment plant operations. Using the concepts of cost and production functions, the possibility was explored for developing useful models for the operation of waste treatment plants. The Federal Water Control Act and the 1972 Amendments have given the states the problem of developing and monitoring regional plans for improving water quality. GRA

N75-15212# Coast Guard Research and Development Center, Groton, Conn.
TAR POLLUTION SURVEY AT GOLDEN BEACH, FLORIDA Final Report
M. Curtis and W. Saner May 1974 28 p refs
(AD-786632; CGR/DC-14/74; USCG-D-3-75) Avail: NTIS CSCL 13B

A beach area on the southeast Florida coast was systematically sampled in order to measure ambient levels of coastal tar pollution, to evaluate the effect of sampling zones of varying sizes, and to determine the effect of tar buildup on the beach with time. In addition, the effect of wind on tar deposition was also determined. Results demonstrate that a sampling zone as small as 20 feet in length produced tar loading data as reliable as a zone 160 feet in length. There was a proportionately heavier deposition of tar on the most northerly situated zones whenever the wind blew from either east or west. This disproportionate tar deposition was not effected, however, until 24 hours later. A southerly wind, on the other hand, caused no disproportionate tar stranding. Most tar came ashore whenever the wind blew from the northeast during the 24-hour periods prior to sampling. (Modified author abstract) GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N75-15213 Institut d'Aeronomie Spatiale de Belgique, Brussels.
ON THE PRODUCTION OF NITRIC OXIDE BY COSMIC RAYS IN THE MESOSPHERE AND STRATOSPHERE
M. Nicolet 1974 34 p refs Submitted for publication
(Aeronomica-Acta-A-134-1974) Avail: Issuing Activity

Nitric oxide formation in the atmosphere through the ionization and dissociation of molecular nitrogen by galactic cosmic rays is reviewed. One NO molecule is formed for each ion pair produced by cosmic ray ionization. The day and night integrated input to the lower stratosphere is of the order of 6 times 10 to the seventh power NO molecules/sq cm sec in the auroral zone for a geomagnetic latitude more than or equal to 60 deg during the minimum of sunspot cycle and 4 times 10 to the seventh power NO molecules/sq cm sec in the subauroral belt and auroral region for geomagnetic latitude more than or equal to 45 deg at the maximum of solar activity. The tropical production is less than 10 to the seventh power NO molecules/sq cm sec above 17 km and at the eqator the production is only 3 million NO molecules/sq cm sec. ESRO

N75-15214 Institut d'Aeronomie Spatiale de Belgique, Brussels.
SIMULTANEOUS UPPER AIR COMPOSITION MEASUREMENTS BY MEANS OF UV MONOCHROMATOR AND MASS SPECTROMETER
M. Ackerman, P. Simon, U. VonZahn (Bonn Univ.), and U. Laux (Bonn Univ.) 1974 28 p refs Submitted for publication
(Contract WRK-209; WRK-235)
(Aeronomica-Acta-A-136-1974) Avail: Issuing Activity

Molecular oxygen and nitrogen number densities in the altitude range 115 to 220 km above Sardinia were measured in two sounding rocket experiments (ESRO Payloads S84 and S90) in February 1972 by a combination of UV monochromators and mass spectrometers. The measured values agree closely with the CIRA 1972 model for the 120 km altitude region. At higher altitudes the O2 profiles measured by UV monochromators indicate deviations from diffusive equilibrium with respect to the N2 profile measured by the mass spectrometers. Author (ESRO)

N75-15215 Institut d'Aeronomie Spatiale de Belgique, Brussels.
NEUTRAL ATMOSPHERE MODELING
G. Kockarts 1974 19 p refs Presented at the Summer Advan. Study Inst., Liege, 29 Jul. - 9 Aug. 1974 Submitted for publication
(Aeronomica-Acta-A-137-1974) Avail: Issuing Activity

Numerical techniques used for the solution of the three-dimensional conservation equations on which thermospheric models are based are examined in detail. It is concluded that further development is needed in numerical techniques used and that long term observation of space and time revolution of all heat sources and sinks of the thermosphere, which are the fundamental input parameters of any atmospheric model, is of critical importance for laying out realistic boundary conditions. Major energy sources, i.e. UV and infrared emission, Joule dissipation from ion neutral interacitons, and atmospheric waves, such as gravity waves and tidal oscillations, together with asymmetry phenomena are reviewed for the present state of the art. ESRO

N75-15216*# Kanner (Leo) Associates, Redwood City, Calif.
ELECTRICAL CONDUCTIVITY OF THE POLAR IONOSPHERE
L. L. Vanyan and I. L. Osipova Washington NASA Jan. 1975 36 p refs Transl. into ENGLISH from the Russian report Pr-138
(Contract NASw-2481)
(NASA-TT-F-16114; Pr-138) Avail: NTIS HC $3.75 CSCL 03B

The Hall and Pedersen conductivities of the sunlit and dark polar ionosphere were calculated from N(h)-profiles obtained from rocket measurements of electron concentrations and ground-based ionospheric probes. Integrated conductivities were obtained as functions of the maximum electron concentration of the E-layer, and also as functions of the activity of the horizontal component of the magnetic field. The conductivity of the auroral zone rises with increase in magnetic activity, but for the absolute value of delta T greater than 250 gamma, the conductivity slows down. Plots of the electrical conductivity of the polar ionosphere were drawn for January, June, and September 1960 from measurements of the critical frequencies of the E-layer at the network of ionospheric stations, using the functions established. Author

N75-15217*# Scientific Translation Service, Santa Barbara, Calif.
HEAT ESCAPE AND DIFFUSION OF HYDROGEN AND DEUTERIUM IN THE THERMOSPHERE OF THE EARTH
Yu. G. Malama Washington NASA Jan. 1975 27 p refs Transl. into ENGLISH from the Russian report
(Contract NASw-2483)
(NASA-TT-F-16113) Avail: NTIS HC $3.75 CSCL 04A

The Monte Carlo method was used for the model of a stationary, flat atmosphere. The obtained concentration profiles were compared with a numerical solution of the diffusion equation. The violation of the Maxwell velocity distribution of H atoms was analyzed, and the effect of this violation on the magnitude of the escape flux and concentration profiles is considered. Author

N75-15218*# Pennsylvania State Univ., University Park. Ionosphere Research Lab.
NEUTRAL WINDS AND ELECTRIC FIELDS FROM MODEL STUDIES USING REDUCED IONOGRAMS
Daniel Edward Baran 10 Oct. 1974 146 p refs
(Grant NGL-39-009-003; Contract N00014-67-A-0385-0017; Grant NSF GA-33446X1)
(NASA-CR-141321; PSU-IRL-SCI-431) Avail: NTIS HC $5.75 CSCL 04A

A relationship between the vertical component of the ion velocity and electron density profiles derived from reduced ionograms is developed. Methods for determining the horizontal components of the neutral winds and electric fields by using this relationship and making use of the variations of the inclinations and declinations of the earth's magnetic field are presented. The effects that electric fields have on the neutral wind calculations are estimated to be small but not second order. Seasonal and latitudinal variations of the calculated neutral winds are presented. From the calculated neutral winds a new set of neutral pressure gradients is determined. The new pressure gradients are compared with those generated from several static neutral atmospheric models. Sensitivity factors relating the pressure gradients and neutral winds are calculated and these indicate that mode coupling and harmonic generation are important to studies which assume linearized theories. Author

N75-15219# Research Inst. of National Defence, Stockholm (Sweden).
ESTIMATION OF FOCAL DEPTH BY pP AND sP PHASES
Masahiro Yamamoto Dec. 1974 36 p refs
(FOA-C-20027-T1) Avail: NTIS HC $3.75

A procedure is defined for estimating the focal depth of seismic events from secondary phases reported by a network of seismic stations. Phases are selected that can be interpreted as pP or sP and are used for estimating the depth itself. Emphasis is placed on various aspects of the applicability of this method. An experiment is conducted with data form some 300 Japanese earthquakes. It is possible to obtain depth estimates for 70 percent of the events with m sub b (GS) greater than or equal to 5.0. An even higher applicability to events at depths below 100 km is noted. The problem of positively identifying the reflected phases pP and sP from the recordings at a single station is studied. Large differences in the frequency of reporting secondary phases between different stations were observed. By combining the readings of several seismologists it was possible to bring down the number of unidentified phases. Author

N75-15220*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EVALUATION AND COMPARISONS OF RECENT GEOPOTENTIAL SOLUTIONS
M. A. Khan Sep. 1974 39 p refs Submitted for publication
(NASA-TM-X-70796; X-921-74-275) Avail: NTIS HC $3.75 CSCL 20J

A statistical evaluation of some of the recent satellite determined gravity models, including some with distinct data base, indicates that the geopotential coefficients of these models are individually meanir.gful for frequencies with wave numbers n = 2 through 7 certainly and wave numbers n = 8 through 10 probably. Geopotential coefficients in higher frequency ranges while apparently important for computing accurate satellite orbits seem to have little geophysical significance in an individual sense. Differences between various gravity models and those satellite purely between determined geopotential models and their associated combination models show no consistent relationship to surface gravimetric coverage. Additional classical tracking data are important in improving the existing description of the earth's gravity field but their contribution in extending its frequency range beyond what is now available is uncertain. Author

N75-15221*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EFFECT OF TEMPERATURE OSCILLATION ON CHEMICAL REACTION RATES IN THE ATMOSPHERE
Igor J. Eberstein Nov. 1974 13 p refs Submitted for publication
(NASA-TM-X-70813; X-912-74-341) Avail: NTIS HC $3.25 CSCL 04A

The effect of temperature fluctuations on atmospheric ozone chemistry is examined by considering the Chapman photochemical theory of ozone transport to calculate globally averaged ozone production rates from mean reaction rates, activation energies, and recombination processes. G.G.

N75-15222*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
UNCERTAINTIES IN DERIVED TEMPERATURE-HEIGHT PROFILES
Raymond A. Minzner Sep. 1974 63 p refs
(NASA-TM-X-70809; X-911-74-270) Avail: NTIS HC $4.25 CSCL 04A

Nomographs were developed for relating uncertainty in temperature T to uncertainty in the observed height profiles of both pressure p and density rho. The relative uncertainty delta T/T is seen to depend not only upon the relative uncertainties delta P/P or delta rho/rho, and to a small extent upon the value of T or H, but primarily upon the sampling-height increment Delta h, the height increment between successive observations of p or delta. For a fixed value of delta p/p, the value of delta

T/T varies inversely with Delta h. No limit exists in the fineness of usable height resolution of T which may be derived from densities, while a fine height resolution in pressure-height data leads to temperatures with unacceptably large uncertainties.
Author

N75-15223*# Kanner (Leo) Associates, Redwood City, Calif.
RADIO EMISSION OF THE EARTH AS A PLANET
A. Ye. Basharinov, A. S. Gurvich, and S. T. Yegorov Washington NASA Jan. 1975 215 p refs Transl. into ENGLISH of the book "Radioizlucheniye Zemli kak Planety" Moscow, Nauka Press, 1974 188 p
(Contract NASw-2481)
(NASA-TT-F-16078) Avail: NTIS HC $7.25 CSCL 20J

The physical essentials of microwave sensing of the earth and its atmosphere are presented. Characteristics of the formation of microwave radiation in the earth's atmosphere-surface are examined. Principal emphasis is given to problems yielding a practical outcome, such as determining humidity, moisture content of clouds, continuity of ice cover, moisture content, and temperature of land cover. Experience in satellite measurements in the microwave range is summarized. These measurements were made for the first time on the Cosmos 243 and Cosmos 384 satellites in 1968 and 1970.
Author

N75-15224# Kakioka Magnetic Observatory (Japan).
GEOMAGNETISM, KAKIOKA, 1972
1973 119 p refs
(Rept-90) Avail: NTIS HC $5.25

Results of geomagnetic observations at Kakioka Observatory in Japan during 1972 are presented. The observation procedures and instrumentation are detailed.
N.E.R.

N75-15225# Kakioka Magnetic Observatory (Japan).
GEOMAGNETISM, MEMAMBETSU, 1972
1973 119 p refs
(Rept-91) Avail: NTIS HC $5.25
For Abstract, see N75-15224.

N75-15226# Kakioka Magnetic Observatory (Japan).
GEOMAGNETISM, KANOYA, 1972
1973 120 p refs
(Rept-92) Avail: NTIS HC $5.25
For Abstract, see N75-15224.

N75-15227# Kakioka Magnetic Observatory (Japan).
GEOELECTRICITY, KAKIOKA, MEMAMBETSU, KANOYA, 1972
1973 59 p refs
(Rept-93) Avail: NTIS HC $4.25

Results of geoelectric observations made in 1972 at the Kakioka Magnetic Observatory are presented along with the summary results of two branch magnetic observatories. Atmospheric electric potential gradient and earth-current potential gradient were observed. Main factors of the equipment and measurement are outlined. Results are discussed.
J.M.S.

N75-15228# Kakioka Magnetic Observatory (Japan).
REPORT OF THE GEOMAGNETIC AND GEOELECTRIC OBSERVATIONS, 1972 (RAPID VARIATIONS)
1973 76 p
(Rept-13) Avail: NTIS HC $4.75

Results of observations of the Post-IGC, carried out by the Kakioka Magnetic Observatory in close cooperation with its two branch magnetic observatories, are presented. Standardization and comparison services of absolute magnetic instruments are operated by the electro-magnetic standard magnetometer A-56 and the proton procession magnetometer MO-P. Results of observations of rapid variations and records of the rapid-run induction magnetograms and rapid-run tellurigrams are included.
Author

N75-15229*# California Univ., Berkeley.
ANALYSIS OF THREE-COMPONENT AEROMAGNETIC DATA Final Report, 1 Jul. 1972 - 30 Jun. 1973
B. K. Bhattacharyya and Lei-Kuang Leu 30 Jun. 1973 92 p refs
(Contract NAS2-7159)
(NASA-CR-137593) Avail: NTIS HC $4.75 CSCL 08N

The numerical method of obtaining three field components from total field measurements, using double Fourier series expansion, is presented. The expressions for moments of the anomalous field components over a finite area are given. The magnitude and direction of the magnetization vector indicate that the vertical component of the magnetic field calculated from total field observations is more accurate at higher geomagnetic latitudes than at lower latitudes. The opposite is true for the horizontal components. The error in determining the magnetization vector directions are significantly large over most of the range of variation of declination and inclination of the vector, demonstrating the practical limitations of computing field components from total field data even under the best of conditions.
Author

N75-15230# Academy of Sciences (USSR), Moscow. Inst. for Space Research.
DIRECT MEASUREMENTS OF ION DRIFT VELOCITY IN THE UPPER IONOSPHERE DURING A MAGNETIC STORM. PART 2: RESULTS OF MEASUREMENTS DURING THE NOVEMBER 3, 1967 MAGNETIC STORM
Y. I. Galperin, V. N. Ponomarev, and A. G. Zosimova 1974 37 p refs Submitted for publication
(PR-160) Copyright. Avail: NTIS HC $4.00

Measurements of ion drift (convection) velocity made from the Cosmos-184 oriented satellite at 630 km altitude during a magnetic storm are given. The measurements were carried out for the velocity component approximately normal to the direction towards the sun over both the northern and southern (polar) caps and auroral zones. Observations of the western negative electrojet polarization during a substorm and of the western positive electrojet are discussed.
ESRO

N75-15231# Ohio State Univ., Columbus. Dept. of Geodetic Science.
CLOSED COVARIANCE EXPRESSIONS FOR GRAVITY ANOMALIES, GEOID UNDULATIONS, AND DEFLECTIONS OF THE VERTICAL IMPLIED BY ANOMALY DEGREE VARIANCE MODELS Scientific Interim Report
C. C. Tscherning and Richard H. Rapp May 1974 5 p refs
(Contract F19628-72-C-0120; AF Proj. 8607)
(AD-786417; DGS-208; AFCRL-TR-74-0231; SR-14) Avail: NTIS CSCL 08/5

A new anomaly degree variance model is developed by considering potential coefficient information to degree 20, and updated values of the point anomaly variance, the 1 degree block variance, and the 5 degrees block variance. This new model and several other models were used to develop closed expressions for the covariance and cross-covariance functions between gravity anomalies, geoid undulations (or height anomalies), and deflections of the vertical. (Modified author abstract)
GRA

N75-15232# Environmental Prediction Research Facility (Navy), Monterey, Calif.
THE EFFECT OF UTILIZING EMPIRICALLY DERIVED VALUES OF COALESCENCE EFFICIENCY IN A MICROPHYSICAL CLOUD MODEL
Paul M. Tag Sep. 1974 42 p refs
(WF52551715)
(AD-786699; ENVPREDRSCHF-TP-13-74) Avail: NTIS CSCL 04/2

A one-dimensional eulerian warm cloud model which incorporates the effects of stochastic coalescence, drop breakup, and vertical water mass transfer is used to determine the effect of empirically derived values of the coalescence efficiency. A constant vertical updraft profile is used to artificially produced liquid water increases and to produce a realistic restraint for hydrometeor fallout. Although most microphysical models have assumed coalescence efficiency to be equal to one, the recent work of Whelpdale and List, and Levin et al., indicate that coalescence efficiency is closely related to droplet/drop size ratio P, and decreases with increasing P. Starting with an initial droplet spectrum for a tropical cumulus which produces rain within 20 minutes when using a coalescence efficiency of one, comparative runs are made using the empirical data. (Modified author abstract)
GRA

N75-15233# Army Foreign Science and Technology Center, Charlottesville, Va.
WEATHER MODIFICATION AND RADAR INVESTIGATIONS
M. V. Buikov and V. M. Muchnik 13 Nov. 1973 162 p refs Transl. into ENGLISH from Aktivn. Vozdeistviya i Radiolokatsionnye Issled. (Moscow), no. 103, 1971 p 1-144
(AD-786815; FSTC-HT-23-1180-73) Avail: NTIS CSCL 04/2

Problems of artificial modification of convective and stratiform clouds, some problems of simulating elements of radar equipment, and statistical characteristics of reflected radar signals are examined. A number of the articles deal with elementary processes in thunderstorm clouds, ice-forming reagents using infrared spectroscopy as the means of investigation, and laboratory studies of the passivation of condensation nuclei. The collection is intended for specialists and scientific personnel in atmospheric physics. Author (GRA)

N75-15234# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SEISMIC DISCRIMINATION Semiannual Technical Summary Report, 1 Jan. - 30 Jun. 1974
Michael A. Chinnery 30 Jun. 1974 71 p refs
(Contract F19628-73-C-0002; ARPA Order 512)
(AD-785377; ESD-TR-74-221) Avail: NTIS CSCL 17/10

Contents: International seismic month; Data management; Earthquake source mechanisms; Focal depth; Surface-wave studies; Earth heterogeneity; General seismology. GRA

N75-15235# University of Southern Calif., Los Angeles. Geophysical Lab.
SURFACE WAVE STUDIES ON CRUSTAL AND MANTLE STRUCTURE OF CHINA
James P. Tung and Ta-Liang Teng 1974 61 p refs
(Grant AF-AFOSR-2606-74)
(AD-784911; TR-74-2; AFOSR-74-1342TR) Avail: NTIS CSCL 08/11

A multiple-filter technique was applied to long-period World-wide Standardized Seismographic Network (WWSSN) and high-grain records of earthquakes in southeastern Asia to extract group velocity dispersion data. Seismograms of surface wave-paths crossing the Tibetan platform and South China platform were used to obtain data on local crustal and upper mantle structures. GRA

N75-15236# Air Force Avionics Lab., Wright-Patterson AFB, Ohio.
A COMPREHENSIVE BIBLIOGRAPHY OF BALL LIGHTNING REPORTS Technical Report, Oct. 1969 - Aug. 1973
J. D. Barry Jan. 1974 37 p refs
(AD-787209; AFAL-TR-73-348) Avail: NTIS CSCL 04/1

A comprehensive bibliography of ball lightning reports and associated references has been accumulated. The ball lightning references were taken from reports published on scientific journals during the past 350 years. The bibliography is listed in alphabetical order by author's name. The bibliography is the most complete to date. Author (GRA)

N75-15237# Army Foreign Science and Technology Center, Charlottesville, Va.
OPTICAL QUANTUM GENERATORS IN GEODETIC MEASUREMENTS
M. T. Prilepin and A. N. Golubev 1974 182 p refs Transl. into ENGLISH of the book "Opticheskie Kvantovye Generatory v Geodezicheskikh Izmereniyakh" Moscow, 1972 168 p
(AD-787281; FSTC-HT-23-1170-73) Avail: NTIS CSCL 08/5

The book considers the theoretical and practical problems of the application of optical quantum generators in contemporary geodetic measurements. It also offers an analysis of completed experiments and describes laser geodetic apparatus and measuring systems and methods. The book is made up of four chapters. The first chapter will familiarize the reader with certain problems connected with the application of optical quantum generators. The second chapter is devoted to the use of lasers in terrestrial range finder systems. Pulse, phase, and interference methods of measuring distances using optical quantum generators are discussed. The third chapter discusses laser systems for measuring large distances (to the earth's artificial satellites and to the moon) and gives an analysis of the accuracy of such systems and describe experiments which have been conducted. In the fourth chapter other geodetic applications of optical quantum generators are discussed. GRA

N75-15238# Naval Postgraduate School, Monterey, Calif.
SMALL SCALE PROPERTIES IN THE MARINE BOUNDARY LAYER M.S. Thesis
Theron Carl Bone Sep. 1974 69 p refs
(AD-787373) Avail: NTIS CSCL 04/2

Fluctuating velocity and temperature data collected from instruments mounted at three levels on the R/V ACANIA were analyzed. The structure of atmospheric turbulence was examined on the basis of spectral distributions of wind and temperature fluctuations over the ocean. The results of this study were used to determine the validity of present formulations and prediction techniques for the momentum flux and the temperature-structure parameter over water. (Modified author abstract) GRA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N75-15239# National Weather Service, Silver Spring, Md. Techniques Development Lab.
AUTOMATED CEILING AND VISIBILITY FORECASTS: AN EVALUATION OF AN OPERATIONAL TEST, PHASE 3 Final Report, Jan. - Sep. 1973
Richard L. Crisci Sep. 1973 20 p refs
(Contract DOT-FA67WAI-131)
(AD-773711; FAA-RD-73-182) Avail: NTIS HC $4.75

An operational test was conducted to determine the feasibility of providing automated objective guidance to field forecasters responsible for issuing aviation terminal forecasts. Single-station equations for the prediction of the probability of specified ceiling and visibility categories were implemented for 22 U.S. terminals. Decisions involved in the implementation procedure are discussed. The effectiveness of the guidance forecasts is evaluated with respect to timeliness, reliability, accessibility, repeatability, acceptance by the users, and accuracy. Author

N75-15240# National Meteorological Center, Suitland, Md. Development Div.
AN EVALUATION OF THE NATIONAL METEOROLOGICAL CENTER'S EXPERIMENTAL BOUNDARY LAYER MODEL
Paul D. Polger Dec. 1974 20 p refs
(NOAA-TM-NWS-NMC-55) Avail: NTIS HC $3.25

A planetary boundary layer model (PBL) was examined to determine its utility. The PBL model has eight levels, surface to 1600 m, and a horizontal grid mesh of 190.5 km over the contiguous United States. Forecasts were based on 0000 G.m.t. data and were run to 24 hours. The parameters forecast by the PBL model include temperature, winds, relative humidity, freezing levels, precipitation type, and severe weather indices. The results show that the PBL model has potential for providing useful forecasts of ceiling/visibility combination, rain vs. snow delineation, and areas of severe weather and temperature changes over the eastern two-thirds of the United States. Author

N75-15241# Army Foreign Science and Technology Center, Charlottesville, Va.
DETERMINATION OF THE REFRACTIVE INDEX OF AIR BY THE DISPERSION METHOD USING RADIO WAVES
V. N. Bondarenko 5 Nov. 1973 12 p refs Transl. into ENGLISH from Geodez. i Kartograf (Moscow), no. 5, 1972 p 52-59
(AD-785947; FSTC-HT-23-0995-73) Avail: NTIS CSCL 20/6

The authors derive formulas which can be used to determine the refractive index of air with a known accuracy (an upper bound on the error). The formulas, which are based on the dispersion method, are functions of the difference of the optical paths of light and radio waves, the absolute air temperature, and atmospheric pressure. GRA

N75-15242# Army Foreign Science and Technology Center, Charlottesville, Va.
VERTICAL STRUCTURE OF SUMMER FOGS IN THE DIKSON ISLAND AREA
P. A. Vorontsov and V. I. Selitskaya 16 Apr. 1974 27 p refs Transl. into ENGLISH from Trudy Arkt. i Antarkt. Nauchno- Issled. Inst. (Leningrad), v. 228, no. 1, 1959 p 87-99
(AD-786843; FSTC-HT-23-363-74) Avail: NTIS CSCL 04/2

The Arctic and Antarctic Institute, with the Main Geophysical Observatory, carried out in July - August 1967 a series of tethered meteorograph ascents in the Dikson Island area to study the vertical structure of the atmosphere when fog is present. The meteograph ascents were made at two-hour intervals to an altitude of 500 m. GRA

N75-15243# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
OPTICAL TECHNIQUES FOR THE MEASUREMENT OF CROSSWINDS
Thomas H. Pries, Erick T. Young, and Jack Smith 1973 14 p refs
(AD-785664) Avail: NTIS CSCL 04/2

The need for accurate horizontal surface crosswind information to support direct artillery fire delivered by armored vehicles is well established. A path-integrated crosswind accurate to plus or minus 0.5 m/s (plus or minus 1 knot) is a requirement that is not met with current Army capabilities (1). The most advantageous means of obtaining this quantity would be some remote sensing technique. The paper discusses systems being investigated by the Atmospheric Sciences Laboratory, US Army Electronics Command, White Sands Missile Range, New Mexico, for use in the field Army. GRA

N75-15244# Scripps Institution of Oceanography, San Diego, Calif. Visibility Lab.
AVAILABILITY AND CREDIBILITY OF MARITIME VISIBILITY OBSERVATIONS
Catharine F. Edgerton Jul. 1974 45 p
(Contract N00123-74-C-0251)
(AD-786762; ML-74-004T) Avail: NTIS CSCL 04/2

The purpose of this study was to evaluate existing maritime meteorological data and research efforts on various aspects of interest for the general problem of determining the effect of the environment on the operation of naval electro-optical systems. The areas of interest included visibility at sea, the credibility of existing visibility data, methods for accurately determining visibility at sea, cloud free lines of sight (CFLOS), methods for extending visibility measurements made in the visible to the infrared, precipitation data over oceans, lidar measurements of visibility, and the sources of maritime meteorological observations. The credibility of existing visibility measurements is important for the accurate determination of the probabilities that certain ranges of visibility will be encountered. (Modified author abstract) GRA

N75-15245# Scripps Institution of Oceanography, San Diego, Calif. Visibility Lab.
VISIBILITY AT SEA: AN ANNOTATED BIBLIOGRAPHY
Catharine F. Edgerton Jun. 1974 47 p refs
(Contract N00123-74-C-0251)
(AD-786758; SIO-REF-74-21) Avail: NTIS CSCL 04/2

A major concern of various Codes at the Naval Weapons Center and the Naval Electronics Laboratory Center has been the effect of weather on the operation of naval electro-optical systems. A literature search was undertaken to study and evaluate research efforts and the state of the art of various aspects of the problem. The areas of interest included: Measurement of visibility at sea; Methods for accurately determining visibility at sea; Cloud free lines of sight (CFLOS); Methods for extending visibility measurements made in the visible to the infrared; Lidar measurements of visibility; Precipitation data over oceans; and Sources of Visibility Data. An annotated bibliography of this search was compiled and is presented alphabetically by author. The source materials are listed separately. GRA

N75-15246# Sydney Univ. (Australia). Civil Engineering Labs.
ON THE PREDICTION AND EVALUATION OF THE GROUND LEVEL WIND ENVIRONMENT
B. J. Vickery and L. W. Apperley Oct. 1973 26 p refs
(PB-234774/8; R-227) Avail: NTIS HC $3.75 CSCL 04B

Tentative acceptance criteria for ground level wind speeds are presented together with a description of an experimental approach to the prediction of the ground level wind environment. The method of prediction relies on the use of models to determine the ratios of the ground level mean and gust speeds to a reference speed at a height well clear of the influence of terrain roughness. The measured wind speed ratios are then used in conjunction with the known statistics of the reference speed to predict the ground level climate. In the Sydney area the statistics of the reference speed were derived from balloon data. GRA

N75-15247# Sydney Univ. (Australia). Civil Engineering Labs.
ON THE PREDICTION OF EXTREME WIND SPEEDS FROM THE PARENT DISTRIBUTION
L. Gomes and B. J. Vickery Mar. 1974 39 p refs
(PB-234777/1; R-241) Avail: NTIS HC $3.75 CSCL 04B

The application of Rice's crossing rate equation to the determination of extreme wind speeds is examined. Using wind speed data from the Bureau of Meteorology's Observatory Hill Station, Sydney, the parameters required for the application of Rice's equation were established. In the course of evaluating these parameters the long term spectrum of wind speed was determined. Extreme speeds given by Rice's formula are compared with those determined by methods proposed by Gumbel and by Davenport. The effect of seasonal variations in the wind speed distribution is examined. (Modified author abstract) GRA

N75-15248# Meteorology Research, Inc., Altadena, Calif.
ARIZONA WEATHER MODIFICATION RESEARCH PROGRAM Final Report
T. B. Smith, Donald M. Takeuchi, and C. W. Chien 28 Feb. 1974 144 p refs
(Contract DI-14-06-D-6581)
(PB-235326/6; MRI-73-FR-1094; REC-14-06-D-6581-F) Avail: NTIS HC $5.75 CSCL 04B

The Arizona Program developed optimization procedures and formulated techniques for promoting mesoscale organization of convective systems. Several microphysics models were developed to permit computer simulation of these processes. Much time and effort were devoted to acquisition and analysis of observational data for comparison with model calculations. Development of techniques for the rapid assimilation of synoptic weather data for the purposes of treatment decision making was considered to be a part of the problem of developing optimization procedures. GRA

N75-15249# Rosenstiel School of Marine and Atmospheric Sciences, Coral Gables, Fla. Radar Meteorological Lab.
AN OPERATIONAL GUIDE FOR THE AN/TPS-41 RADAR Final Report, 1 Jun. 1972 - 31 Aug. 1973
Homer W. Hiser May 1974 109 p refs
(Contract DAAB07-72-C-0218; DA Proj. 1T0-61102-B-53A)
(AD-787352; ML-UM-RSMAS-B7897-2; ECOM-0218-F) Avail: NTIS CSCL 17I

The report is an operational guide for the use of the Weather Radar Set, AN/TPS-41 by personnel other than professionally trained meteorologists to collect and interpret meteorological data. The first part of this report provides introductory material on common major components of radars, a discussion of the basic radar formula, and a brief review of radar operation to gain optimum echo observation. The balance of the report covers radarscope interpretation, operational techniques for applying radar data, illustrations of storms observed by radar, and nuclear surveillance. Author (GRA)

N75-15250# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
PRECIPITATION CHARACTERISTICS IN THE NORTHEAST BRAZIL DRY REGION Atmospheric Science Paper
Rodolpho PaesLemeRamos May 1974 62 p refs
(Grants NSF GA-32589x2; NSF GA-29147)
(PB-235329/0; AS-Paper-224) Avail: NTIS HC $4.25 CSCL 04B

Information on the individual episode precipitation characteristics in the Northeast Brazil dry region during its rainy season

from December through April is presented. The distribution of rainfall and its frequency are studied in relation to wind, temperature, humidity, and pressure fields. It is found that most of the yearly rainfall comes in 6-8 episodes from organized weather systems which move from the east to west with about the same speed as the lower tropospheric wind flow. These systems appear not be of local origin. The ocean is their moisture source. Rainfall is inversely correlated with the regional subsidence and trade wind inversion intensity. (Modified author abstract) GRA

N75-15251# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
RAINFALL IN WEST CENTRAL AFRICA
Samuel Mbele-Mbong May 1974 137 p refs
(Grant NSF OGA-29147)
(PB-235328/2; AS-Paper-222; US-ISSN-0067-0340) Avail: NTIS HC $5.75 CSCL 04B

An estimation of the relative importance of various factors to the rainfall in West Central Africa has been attempted. The factors considered were tropical waves, monsoon depressions, the position of the intertropical discontinuity and the tropical easterly jet stream of summer. Eleven years (1954-1964) of daily rainfall amounts at 20 stations in Cameroon, Central Africa Republic, Congo, Gabon and Chad were analyzed using spectral and cross spectral methods. (Modified author abstract) GRA

N75-15252# North Carolina Univ., Chapel Hill. Dept. of Geography.
MESOCLIMATIC HEAT STRESS VARIATIONS MEASURED BY THE WET-BULB-GLOBE-THERMOMETER Final Report, 1 Jun. - 1 Sep. 1973
Richard J. Kopec and Arthur V. Dodd 1 Sep. 1974 21 p refs
(Grant DA-ARO(D)-31-124-73-G163)
(AD-787539; AROD-11772-1-GS) Avail: NTIS CSCL 04/2

Observations were taken on 19 days in July and August 1973 with instrumentation designed to allow computation of the wet-bulb-globe-temperature heat-stress index (WBGT) at selected locations in central North Carolina. The purpose of the observational program was to assess the effects at local influences such as tree cover, surface material, and urbanization on the WBGT. In most cases observations were taken simultaneously at a standard site (over grass) and a special site where significantly different WBGT values might be expected. At standard sites there were 221 observations with an average WBGT of 85F and a maximum WBGT of 92F. An important conclusion of the study therefore is that spot readings of the WBGT must be interpreted carefully where variable cloudiness is a factor. WBGT values under a forest canopy averaged 7-9F lower than in the open, indicating a significant difference in heat stress between open and wooded locations. (Modified author abstract) GRA

N75-15493 Joint Publications Research Service, Arlington, Va.
ON THE FREQUENCIES OF A FIXED DAY OF THE SUMMER MONTHS IN THE COUNTRY TO FALL IN PERIODS WITH POSITIVE OR NEGATIVE ANOMALIES OF THE MEAN DIURNAL TEMPERATURES
Stephan I. Stefanov *In its* Transl. of Eastern Europe, No. 445 (JPRS-63684) 17 Dec. 1974 p 12-18 refs Transl. into ENGLISH from Khidrol. Meteorol. (Sofia), no. 4, 1974 p 13-17 (For availability see N75-15491 06-81)

N75-15494 Joint Publications Research Service, Arlington, Va.
WIND SEASONS IN THE FREE ATMOSPHERE OVER BULGARIA DESCRIBED
K. Stanchev, L. Milenkova, and V. Nabatova *In its* Transl. of Eastern Europe, No. 445 (JPRS-63684) 17 Dec. 1974 p 19-29 refs Transl. into ENGLISH from Khidrol. Meteorol. (Sofia), no. 4, 1974 p 19-27 (For availability see N75-15491 06-81)

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N75-15253*# Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
AN INVESTIGATION OF ENVIRONMENTAL FACTORS ASSOCIATED WITH THE CURRENT AND PROPOSED JETTY SYSTEMS AT BELLE PASS, LOUISIANA Final Report
Elvin J. Dantin, Charles A. Whitehurst, and Warren T. Durbin 6 Nov. 1974 44 p refs
(Grant NGL-19-001-105)
(NASA-CR-141312) Avail: NTIS HC $3.75 CSCL 08C

The history of the existing jetty system at Belle Pass was investigated to determine its past effect on the littoral currents and beach erosion. Present flow patterns and erosion rates were also studied, along with the prevailing recession rates of local beaches not influenced by the jetty system. Aerial photographs and maps were used in conjunction with periodic hydraulic measurements, ground observations, and physical measurements of beach erosion. A scale model was constructed to further the study of flow patterns and velocities. It is shown that the existing jetty has not adversely affected the coastline in the area; erosive processes have been retarded by the jetty and its companion groin. Future erosion patterns are predicted, and projected effects of the proposed jetty system are given. N.E.R.

N75-15254# Defence Research Establishment Ottawa (Ontario).
RADAR POSITION DATA REDUCTION PROGRAMS FOR THE XEROX SIGMA 9
John W. Moffat Jul. 1974 78 p refs
(AD-786289; DREO-TN-74-19) Avail: NTIS CSCL 08/12

Computer programs for the organization and preliminary reduction of radar position data are described. The basic functions served by the programs are checking the position data for errors and writing the corrected data on magnetic tape, plotting the position data stored on magnetic tape using the Calcomp plotter, calculating the down and cross-channel velocity components from the position tape file data, and writing them on a second magnetic tape; and, plotting the velocity components using the Calcomp plotter. Author (GRA)

N75-15255# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
TYPE 16 FLOOD INSURANCES STUDY: TSUNAMI PREDICTIONS FOR PACIFIC COASTAL COMMUNITIES Final Report
James R. Houston and Andrew W. Garcia May 1974 139 p refs
(AD-785533; AEWES-TR-H-74-3) Avail: NTIS CSCL 08/3

Calculations of runup due to seismic sea waves (tsunamis) of distant origin are made for 15 coastal communities within the state of California and 3 coastal communities within the state of Alaska. The values given are interpreted as being equaled or exceeded on the average of once per 100 or once per 500 years, whichever is indicated. The combined effects of astronomical tides and tsunamis are incorporated into the analysis as well as local resonance effects where judged significant. A complete discussion of the methodology is presented. It is essential that these runup predictions be reviewed approximately every five years in the light of advancements in the theory of tsunami generation, propagation, and runup. (Modified author abstract) GRA

N75-15256# Naval Oceanographic Office, Washington, D.C.
OCEANOGRAPHIC SURVEY REPORT, SEA OF JAPAN Final Report, Oct. 1967 - Jun. 1968
May 1974 216 p refs
(AD-786136; NOO-SP-133-18-1) Avail: NTIS CSCL 08/10

A geological/geophysical and oceanographic survey was conducted in the Sea of Japan from October 1967 to June 1968 aboard the USNS SILAS BENT and the R/V F. V. HUNT. Dominant physiographic features of the sea are: Japan Basin (including Japan Abyssal Plain), Tatar Trough, Yamato Ridge, Korea Continental Borderland, and the continental slope. Three major stratigraphic units were recognized in the seismic profiles: (1) basement, (2) folded, faulted, and discontinuous sediments overlying basement, and (3) flat uppermost sediments. Most of the cored sediments were in the fine-silt to clay range; however, Japan Abyssal Plain had coarsed-textured turbidities. Large seasonal changes in surface water properties were observed.

An extensive list of references is included in the report. (Modified author abstract) GRA

N75-15257# Williams Coll., Williamstown, Mass.
BEACH PROCESSES ON THE OREGON COAST, JULY 1973
William T. Fox and Richard A. Davis, Jr. 30 Aug. 1974 89 p refs Prepared in cooperation with University of South Florida, Tampa
(Contract N00014-69-C-0151; NR Proj. 388-092)
(AD-786237; WC-12) Avail: NTIS CSCL 08/3

During July and August, 1973, a 45-day time-series study was undertaken on the central Oregon coast to relate weather and wave conditions to beach erosion and sand bar migration. The summer weather pattern was dominated by the East-Pacific subtropical high which produced winds and waves from the northwest and extended periods of upwelling and coastal fog. When low pressure systems moved through, wind and waves shifted to the southwest. Three beaches were mapped at low tide to show changes in beach and bar morphology through time. At South Beach, Oregon two sets of bars with intervening rip channels advanced shoreward at 1 to 5 meters/day and southward at 10 to 15 meters/day. At Beverly Beach, Oregon, a basalt ridge 700 meters offshore resulted in wave diffraction and sand deposition in the central portion of the beach. A rip channel at the south end of the beach moved 300 meters to the south. At Gleneden Beach, cusps 40 meters long were cut into the steep foreshore. (Modified author abstract) GRA

N75-15258# Washington Univ., Seattle. Applied Physics Lab.
A CALCULATION OF THE ACOUSTIC SHEAR WAVE ATTENUATION IN SEA ICE Final Report
J. G. Hanse and R. E. Bunney Jul. 1974 46 p refs
(Contract DOT-CG-24595-A)
(AD-786707; APL-UW-7310; USCG-D-12-75) Avail: NTIS CSCL 08/12

The attenuation of an acoustic disturbance propagating in a medium which is not perfectly elastic, homogeneous and isotropic can be considered to be the result of energy dissipation due to classical processes and scattering. The contribution of each of these mechanisms is dependent upon the frequency of the sound wave. In this report several mathematical models are discussed for a transverse wave moving in a visco-elastic material and a scattering theory is developed. The theory is applied to sea ice and attenuation as a function of frequency is predicted for this material. Author (GRA)

N75-15259# Defence Research Establishment Ottawa (Ontario).
RADAR MEASUREMENT OF ICE DRIFT IN ROBESON CHANNEL, 1972
John E. Keys, Moira Dunbar, D. J. Finlayson, and J. W. Moffat Aug. 1974 45 p refs
(AD-786998/5; DREO-TN-74-21) Avail: NTIS HC $3.75 CSCL 08/12

The report describes a technique used for measuring ice drift in Robeson Channel, Ellesmere Island, using an X-band radar mounted on a cliff to track transponders placed on the ice. The transponder stations were equipped with wind recorders and, when possible, current meters. The PPI was read manually every hour and a film record made, one shot being taken per minute. The manual readings were fed into a computer and a plot generated in the field. The film record was later digitized and corrected plots made. These are included with samples of the field plots. Author (GRA)

N75-15260# Environmental Prediction Research Facility (Navy), Monterey, Calif.
MESOSCALE FEEDBACK FROM THE OCEAN TO THE ATMOSPHERE IN COASTAL AND OCEANIC FRONTAL REGIONS
T. Laevastu and Glenn D. Hamilton Sep. 1974 49 p refs
(WF52551713)
(AD-787481; ENVPREDRSCHF-TP-14-74) Avail: NTIS CSCL 04B

The purpose of the study has been: (a) to investigate the processes involved in the mesoscale feedback process and effects of the feedback on the lower layers of the atmosphere; (b) to investigate the response of surface air to sea-surface properties; (c) to determine the range of the coastal influence and the effects of coastal fronts on the surface layers in the atmosphere; (d) to investigate the possibility of recognizing oceanic frontal effects with routine ship observations; and (e) to look into the accounting of feedback in numerical models. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N75-15261*# Food and Drug Administration, Cincinnati, Ohio. Div. of Microbiology.
ECOLOGY AND THERMAL INACTIVATION OF MICROBES IN AND ON INTERPLANETARY SPACE VEHICLE COMPONENTS Quarterly Progress Report
J. E. Campbell, A. L. Reyes, A. J. Wehby, R. G. Crawford, J. C. Wimsatt, and J. T. Peeler Oct. 1974 10 p
(NASA Order W-13411)
(NASA-CR-141122; QPR-37) Avail: NTIS HC $3.25 CSCL 06M

Dry heat sterilization of spacecraft was investigated by studying the production of spore crops, and thermal inactivation of the spores, and bacillus subtillus. Spore assays were made by conventional plate count methods, and survival curves for the spores are presented. The results indicate that the inherent resistance of spores from a parent cell can be maintained. F.O.S.

N75-15262*# Texas Univ., Houston. Dept. of Biomathematics.
[METHOD AND DATA EVALUATION AT NASA ENDOCRINE LABORATORY] Final Report, 1 Jul. 1972 - 30 Nov. 1974
Dennis A. Johnston Dec. 1974 9 p refs
(Contract NAS9-13042)
(NASA-CR-141469) Avail: NTIS HC $3.25 CSCL 06A

The biomedical data of the astronauts on Skylab 3 were analyzed to evaluate the univariate statistical methods for comparing endocrine series experiments in relation to other medical experiments. It was found that an information storage and retrieval system was needed to facilitate statistical analyses. M.J.S.

N75-15263*# Techtran Corp., Glen Burnie, Md.
DOES IMMOBILIZATION AND PRESSURE BEARING OF A JOINT RESULT IN OSSIFICATION IN AN ANIMAL EXPERIMENT?
K. Walcher and H. Stuerz Washington NASA May 1974 47 p refs Transl. into ENGLISH from Arch. Orthopaed. Unfallchir. (West Germany), v. 71, May 1971 p 216-247
(Contract NASw-2485)
(NASA-TT-F-15562) Avail: NTIS HC $3.75 CSCL 06S

In an animal experiment the complete immobilization and a pressure bearing applied in doses results in a progressive joint-change which leads to an ossification of the joint if the experiment is extended up to 6 months and the compression on the joint has reached and exceeded the limit of the mechanical pressure capacity of the articular cartilage. The transfixion of the knee-joint of a rabbit with the aid of a pressure bolt enabled the application of compressions up to 24 kp which produced pressures on the cartilage of up to 120 kp/sq cm. Five or six joints having been exposed to this pressure bearing showed a through-ossification while of 9 less compressed joints only in 2 cases an ossified ankylosis of the joint was beginning or just in progress. Author

N75-15264*# Smithsonian Institution, Washington, D.C.
SATELLITE ANIMAL TRACKING FEASIBILITY STUDIES Final Report, 31 Dec. 1974
Helmut K. Buechner 8 Jan. 1975 16 p
(Grant NGR-09-015-163)
(NASA-CR-141134) Avail: NTIS HC $3.25 CSCL 06C

A study was initiated in Tsavo National Park to determine movements and home ranges of individual elephants and their relations to overall distribution patterns and environmental factors such as rainfall. Methods used were radio tracking and observa-

tions of visually identifiable individuals. Aerial counts provided data on overall distribution. Two bulls and two cows were radio-tagged in Tsavo West and two bulls and four cows in Tsavo East, providing home range and movement data. The movements of individuals were useful in interpreting relatively major shifts in elephant distribution. Results point to the following preliminary conclusions: (1) elephants in the Tsavo area undertook long distance movements in fairly direct response to localized rainfall; (2) a subdivision of the overall population into locally distinct units may exist during the dry season but did not occur after significant rainfall; and (3) food appears to be the primary factor governing movements and distribution of elephants in the area. Author

N75-15265# National Research Council of Canada, Ottawa (Ontario).
SECONDARY EFFECTS OF SYNERESIS ON THE GAS METABOLISM OF CRUSTACEOUS LICHENS
A. Ried 1974 31 p refs Transl. into ENGLISH from Biol. Zentral., (E. Ger.) v. 79, no. 6, 1960 p 657-678
(NRC-TT-1776) Avail: NTIS HC $3.75

Experiments were carried out on crustaceous lichens to study the affect of the secondary effects of syneresis on the ecological limits of propagation. Factors found to be responsible for lichen zones on the shores of brooks and lakes are: (1) variation in the syneresis conditions from one; and (2) differences in the syneresis resistance of the inhabitants of the flood zone. Results show that (1) only in rare cases could periods of dehydration of the degree found in climatic conditions directly lead to the death of lichen; (2) the reversible secondary effects of syneresis may cause the metabolic balance of lichens to become negative; and (3) moisture and precipitation conditions in the habitat are of critical importance for the propagation of the lichens. J.M.S.

N75-15266*# California Univ., Berkeley. School of Public Health.
POSSIBILITY OF GROWTH OF AIRBORNE MICROBES IN OUTER PLANETARY ATMOSPHERES
R. L. Dimmick and M. A. Chatigny [1975] 35 p refs Sponsored in part by ONR Prepared in cooperation with Naval Biomedical Research Lab.
(Contract NASA Order W-13450)
(NASA-CR-141958) Avail: NTIS HC $3.75 CSCL 06M

It is shown that airborne bacteria can maintain metabolic functions in a suitable atmosphere. It is theorized that particles in the Jovian atmosphere would have physical half-lives of 10 to 1500 years, depending upon which of two turbulent models is chosen. Author

N75-15267# Commission of the European Communities, Brussels (Belgium).
PROGRAMME BIOLOGY: HEALTH PROTECTION Annual Report, 1973
1973 794 p refs In DANISH, GERMAN, ENGLISH, FRENCH, ITALIAN, and DUTCH
(EUR-5138) Avail: AEC Depository Libraries HC $42.75

The 1971 to 1975 program on biology and health protection was adapted to the situation of 3 new states. The program includes a radiation protection (common program) sector and an applications (supplementary program) sector whose fields of research and objectives include measurement and evaluation of the radiation exposure of man and the various components of the ambient environment to ionizing radiation, such as radiation measurements and their interpretation and the study of the transfer and accumulation of radionuclides in the constituents of the environment and in man. Research summaries and lists of publications are included. Author (NSA)

N75-15268# Oak Ridge National Lab., Tenn.
ENVIRONMENTAL SCIENCES DIVISION PUBLICATIONS 1-500: AN ABSTRACTED, INDEXED BIBLIOGRAPHY
Mar. 1974 177 p refs
(Contract W-7405-eng-26)
(ORNL-TM-4545) Avail: NTIS HC $7.00

Indexes are provided by author, keywords, and publication description. Author (NSA)

N75-15269# Louisiana State Univ., New Orleans. Dept. of Surgery.
ANTIBACTERIAL EFFECTS OF HYPERBARIC OXYGEN Final Report, 1 May 1966 - 30 Sep. 1974
George H. Bornside 30 Sep. 1974 15 p refs
(Contract N00014-66-C-0189; NR Proj. 136-664)
(AD-785860) Avail: NTIS CSCL 06/13

The research was concerned with inhibitory effects of an environment of hyperbaric oxygen on bacterial growth. A portion of the effort was directed to experimental epidemiological studies of the development and transfer of antibiotic-resistant bacteria in gnotobiotic mice. Hyperbaric oxygen (3 atm absolute) was a bactericidal agent for bacteria exposed either in vitro or in vivo. The bactericidal effect was dependent upon the duration and intensity of exposure, and was independent of common taxonomical characteristics of bacteria. Exposure of broth cultures to hyperbaric O2 and an antibiotic enhanced antibiotic activity 3-fold. Significantly less killing occurred when bacteria were exposed to high pressure O2 enriched with CO2. Survival of rats with experimental burn wound sepsis was not enhanced by exposure to hyperbaric O2. However, an in vivo bactericidal effect was demonstrated in the colonic flora of rats breathing 100% O2 at 3 atm. Exposure of susceptible bacteria to an antibiotic (tetracycline or kanamycin) in the intestinal tract of germfree mice monoassociated with either Staphylococcus aureus or Serratia marcescens was accompanied by bacterial mutation to resistance to the specific drug. Author (GRA)

N75-15273 Joint Publications Research Service, Arlington, Va.
EFFECT OF 50-MeV PROTONS ON THE TESTES OF MICE
B. S. Fedorenko, V. G. Kondratenko, V. A. Stakanov, A. Bayrakova, I. Babayev, and V. F. Khlaponina *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 26-32 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 16-19 (For availability see N75-15271 06-52)

N75-15274 Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF TUMORS IN DOGS EXPOSED OVER A LONG PERIOD TO LOW DOSES OF EXTERNAL GAMMA IRRADIATION
V. I. Yakovleva *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 33-40 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 20-24 (For availability see N75-15271 06-52)

N75-15280 Joint Publications Research Service, Arlington, Va.
CONTRACTILE FUNCTION OF THE MYOCARDIUM DURING HYPODYNAMIA
G. M. Pruss and V. I. Kuznetsov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 74-81 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 45-49 (For availability see N75-15271 06-52)

N75-15291 Joint Publications Research Service, Arlington, Va.
PECULIARITIES IN THE CHANGE OF MOTOR ACTIVITY OF RATS UNDER CONDITIONS OF HYPO AND HYPERDYNAMIA
B. I. Kogan *In its* Space Biol. Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 133-135 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 78-79 (For availability see N75-15271 06-52)

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N75-15270* National Aeronautics and Space Administration. Pasadena Office, Calif.
REDUCTION OF BLOOD SERUM CHOLESTEROL Patent
Milton Winitz, inventor (to NASA) (Med. Sci. Res. Found.) Issued 19 Nov. 1974 6 p Filed 28 Jul. 1969 Continuation-in-part of abandoned US Patent Appl. SN-510778, filed 1 Dec. 1965

Sponsored by NASA
(NASA-Case-NPO-12119-1; US-Patent-3,849,554; US-Patent-Appl-SN-847815; US-Patent-Class-424-180) Avail: US Patent Office CSCL 06E

By feeding a human subject as the sole source of sustenance a defined diet wherein the carbohydrate consists substantially entirely of glucose, maltose or a polysaccharide of glucose, the blood serum cholesterol level of the human subject is substantially reduced. If 25 percent of the carbohydrate is subsequently supplied in the form of sucrose, an immediate increase from the reduced level is observed. The remainder of the defined diet normally includes a source of amino acids, such as protein or a protein hydrolysate, vitamins, minerals and a source of essential fatty acid. Official Gazette of the U.S. Patent Office

N75-15271# Joint Publications Research Service, Arlington, Va.
SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 8, NO. 6, 1974
10 Jan. 1975 150 p refs Transl. into ENGLISH of Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 3-83
(JPRS-63856) Avail: NTIS HC $5.75

Biomedical research for manned space flight covers the effects of magnetic fields, radiation, hypodynamia, hypoxia, confined environments, and acceleration on human and animal systems. For individual titles, see N75-15272 through N75-15293.

N75-15272 Joint Publications Research Service, Arlington, Va.
BIOLOGICAL EFFECT OF PERMANENT MAGNETIC FIELDS
Z. N. Nakhilnitskaya *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 1-25 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 3-15 (For availability see N75-15271 06-52)

The aftereffects of man's presence in a low strength magnetic field are examined in relation to exobiology and aerospace medicine. Various magnetobiological studies are reviewed for their interaction mechanisms and prevention of unfavorable effects. The different magnetic sensitivity of man of MF changes and the high magnetic sensitivities of different individuals are of special interest. G.G.

N75-15273 Joint Publications Research Service, Arlington, Va.
EFFECT OF 50-MeV PROTONS ON THE TESTES OF MICE **c51**
B. S. Fedorenko, V. G. Kondratenko, V. A. Stakanov, A. Bayrakova, I. Babayev, and V. F. Khlaponina *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 26-32 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 16-19 (For availability see N75-15271 06-52)

The biological effect of 50-MeV protons and Co-60 gamma rays on the testes of mice has been studied pathomorphologically, cytogenetically and cytofluorimetrically. The results show that both types of penetrating radiations in similar doses induce responses and pathological processes. The dose dependence of cytogenetic effects and nuclear changes in spermatogenic cells was discovered in a later research stage. These changes were followed by poorly expressed pathomorphological disorders. In comparison with gamma irradiation, protons with an energy of 50-MeV exhibit a lesser biological effectiveness. Author

N75-15274 Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF TUMORS IN DOGS EXPOSED OVER A LONG PERIOD TO LOW DOSES OF EXTERNAL GAMMA IRRADIATION **c51**
V. I. Yakovleva *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 33-40 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 20-24 (For availability see N75-15271 06-52)

Over a six year period 150 dogs were exposed to chronic and combined gamma irradiation. An autopsy of 74 irradiated animals revealed malignant neoformations in five dogs, benign neoformations in five animals. The greatest number of neoformations was found in those animals which had been exposed to chronic irradiation with the highest dose rate and in the animals which had received the highest total doses during chronic irradiation. Author

N75-15275 Joint Publications Research Service, Arlington, Va.
MODIFICATION OF THE CYTOGENETIC EFFECT OF IONIZING RADIATION UNDER THE INFLUENCE OF PERMANENT MAGNETIC FIELDS
G. V. Galaktionova and A. D. Strzhizhovskiy *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 41-46 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 25-28 (For availability see N75-15271 06-52)

The modifying effect of a permanent magnetic field of 1,000 to 4,500 oe on post radiation changes in the mitotic index and the frequency of aberrant mitoses in the corneal epithelial cells of mice was investigated. A three hour exposure to a permanent magnetic field of 4,500 oe immediately before or after irradiation in a dose of 400 rad exerted an insignificant effect on the cytogenetic effect of ionizing radiation. A five day exposure of animals to a permanent magnetic field of 1,000 oe after irradiation produced no modifying influence on the radiation effect. Irradiation of mice after their 15-day exposure to a permanent magnetic field of 1,000 oe did not alter the post-radiation inhibition of mitotic activity and increased the level of its recovery. Author

N75-15276 Joint Publications Research Service, Arlington, Va.
INFLUENCE OF THE CALCIUM-MAGNESIUM RATIO IN THE NUTRIENT SOLUTION ON THE AFTEREFFECT OF GAMMA IRRADIATION OF CABBAGE SEEDS
Yu. I. Shaydorov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 47-52 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 28-32 (For availability see N75-15271 06-52)

The influence of the calcium-magnesium ratio in nutrient solution on the manifestation of the radiobiological effect of gamma irradiation was investigated. Cultivation of plants from irradiated seeds on solutions with a similar concentration and anion composition and a different calcium-magnesium ratio altered the radiobiological effect. An increased calcium content decreased the biological effectiveness of radiation, whereas an increased magnesium content enhanced it. Author

N75-15277 Joint Publications Research Service, Arlington, Va.
TOXICOLOGICAL-HYGENIC EVALUATION OF WATER EXTRACTS OF F-26 POLYMER FILM
Z. P. Pak, I. L. Krynskaya, Yu. S. Koloskova, and A. A. Ballod *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 53-58 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 32-35 (For availability see N75-15271 06-52)

Sanitary-chemical and toxicological investigations are reported on a representative of polymer materials containing fluorine -- F-26 fluoroplastic. A toxicological evaluation of the material which was used by warm blooded animals for drinking in the form of water extracts revealed no adverse effect of it on the experimental animals. Results of the toxicological and hygienic evaluation of the polymer film F-26 indicate the possibility of its utilization in contact with drinking water. Author

N75-15278 Joint Publications Research Service, Arlington, Va.
TIMELY PROBLEMS IN AVIATION MEDICINE
P. K. Isakov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 59-67 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 35-41 (For availability see N75-15271 06-52)

Flight personnel must show high performance from the takeoff to the landing of the aircraft. The up-to-date methods of preflight medical monitoring therefore require still further improvement. It is necessary to develop special tests which will make possible the prediction of stable performance and a capability for flying during unexpectedly complicated situations. It is important to continue investigations which may help in identifying the most stressful elements of flight activity, to predict resistance to mental stress, to develop methods for the psychophysiological training

of flight personnel for the performance of flight tests of great complexity, to formulate medical criteria for the employment of trainers, and to use tape recordings of voice communications for evaluating the in-flight health of pilots. Author

N75-15279 Joint Publications Research Service, Arlington, Va.
INDICES OF THE WORK QUALITY OF A MAN OPERATOR IN SPACESHIP CONTROL **c54**
V. V. Lebedev and V. A. Krutov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 68-73 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 42-45 (For availability see N75-15271 06-52)

Probability parameters of the quality of man operator performance in spacecraft control have been formulated. The parameters can be applied in the design of a spacecraft as a man machine system, in the training of operators and in spaceflight planning. Author

N75-15280 Joint Publications Research Service, Arlington, Va.
CONTRACTILE FUNCTION OF THE MYOCARDIUM DURING HYPODYNAMIA **c51**
G. M. Pruss and V. I. Kuznetsov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 74-81 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 45-49 (For availability see N75-15271 06-52)

The contractile function of the myocardium was studied on rats exposed to 60-day hypodynamia in relation to the intensity and rate of heart muscle contractions under isotonic and isometric conditions. The contractile function of the myocardium varied physically during hypodynamia. During the first five days the intensity and rate of the myocardial contractions diminished. By the 15th day the contractile function of the myocardium improved and on the 30th day of hypodynamia the basic parameters did not differ from those in the control rats. On the 45th and 60th days the parameters of the contractile function of the myocardium increased slightly. However, beginning with the 30th day of hypodynamia the functional reserve of the heart had decreased, which may lead to cardiac failure. Author

N75-15281 Joint Publications Research Service, Arlington, Va.
STUDY OF THE QUALITY OF REGULATION OF THE CARDIOVASCULAR SYSTEM DURING A PHYSICAL LOAD (BASED ON ECG DATA)
T. V. Benevolenskaya, O. I. Boykova, T. N. Krupina, N. P. Onufriyeva, and Kh. Kh. Yarullin *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 82-89 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 49-54 (For availability see N75-15271 06-52)

In order to evaluate the quality of cardiovascular regulation, particularly cardiac regulation, the transient processes were examined on the basis of ECG parameters. The experiments were carried out with 109 healthy male test subjects with different tolerances to physical exercises. The experiments demonstrated that the curves of the transient processes for the heart rate, QRST complex, time of the T wave and the ST interval during physical exercises and in the aftereffect had an exponential shape. Those for the amplitude of the T wave had an oscillatory shape. Mathematical analysis revealed distinct differences in the cardiovascular control in test subjects with a different tolerance to physical exercises; high tolerance gave evidence for a good adaptive capability of the heart. Author

N75-15282 Joint Publications Research Service, Arlington, Va.
THRESHOLD RESPONSE OF THE VESTIBULAR ANALYZER DURING HYPOXIA
I. A. Sidelnikov and S. S. Markaryan *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 90-95 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 55-58 (For availability see N75-15271 06-52)

In order to determine the pattern of changes in thresholds to angular accelerations by the nystagmus method and illusions of counterrotation during hypoxia and to compare them with vestibular stability, experiments with 40 test subjects were performed. Moderate hypoxia was achieved during 30 minutes of breathing of a gas mixture of 10.5% oxygen and 89.5% nitrogen simulating an altitude of 5,000 m. Sensitivity thresholds and vestibular stability were measured before and at the end of 30 minutes of breathing. During hypoxia sensitivity thresholds of the vestibular analyzer to angular accelerations increased and vestibular stability decreased significantly. This helps to reveal latent forms of vestibular-autonomic instability. Author

N75-15283 Joint Publications Research Service, Arlington, Va.
EFFECT OF A MODIFIED ATMOSPHERE AND INCREASED TEMPERATURE ON THE BREATHING AND METABOLISM OF MAN IN A RESTRICTED CLOSED SPACE
V. G. Deynega and A. F. Isakin *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 96-103 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 58-62 (For availability see N75-15271 06-52)

Changes in pulmonary ventilation and metabolism in ten test subjects are described who for ten days remained at rest in a small enclosure with a CO2 content of 1.2-3.0%, an O2 content of 17.1-19.6%, a temperature of 29.2-32.0 C, a relative humidity of 80-90% and with the caloric intake limited to 1,600 Cal/day. Variations in respiration rate, minute volume of respiration, vital lung capacity, respiratory volume, oxygen consumption, carbon dioxide production, respiratory quotient, energy expenditures and respiratory equivalent were analyzed. The exposure of the test subjects to a modified atmosphere and temperature led to an enhancement of pulmonary ventilation and a reduction in energy expenditures. A mathematical correlation was found between carbon dioxide concentration in inhaled air and minute volume of respiration. Author

N75-15284 Joint Publications Research Service, Arlington, Va.
SEMICONDUCTOR THERMOSTATS FOR SPACEFLIGHT BIOLOGICAL INVESTIGATIONS **c54**
L.S. Stilbans, Ye. K. Iordanishvilli, F.V. Sushkov, A.L. Mashinskiy, E.A. Izupak, and L.M. Gladkikh *in its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 104-107 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec.1974 p 63-65(For availability see N75-15271 06-52)

For the purpose of active thermostating, satisfying all the requirements imposed on biological thermostats, it is most desirable to use semiconductor thermoelectric cells as the cooling-heating elements; their action is based on use of the Peltier effect. The degree of heating or cooling in them, and accordingly, the necessary temperature, is easily set by regulating the current strength. Author

N75-15285 Joint Publications Research Service, Arlington, Va.
OPHTHALMOLOGICAL ASSISTANCE DURING PROLONGED SPACE FLIGHTS
I. A. Kolosov, A. V. Kaliberdin, V. A. Baturenko, and Yu. F. Maychuk *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 108-110 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 65-66 (For availability see N75-15271 06-52)

The possibility of using eye drug films for ophthalmological purposes during weightlessness conditions is studied. EDF are elastic platelets impregnated with neomycin, sulfapyridazine, pilocarpine, atropine, dicaine or dexametazone. It is concluded that eye ointments and EDF prepared by using a biologically soluble polymer base and impregnated with the necessary drugs are suitable for astronauts during prolonged space flight and for inclusion into spacecraft pharmacies. G.G.

N75-15286 Joint Publications Research Service, Arlington, Va.
PECULIARITIES OF THE HUMAN AUDITORY ANALYZER IN A MODIFIED ATMOSPHERE **c53**
E. I. Matsnev and A. V. Sergiyenko *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 111-114 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 67-68 (For availability see N75-15271 06-52)

The influence of hypoxia on the function of human hearing was studied in a pressure chamber containing a modified atmosphere (P02-105-125 mm Hg; PC02 1-12 mm Hg) with

reduced barometric pressure. The functional state of the auditory analyzer was evaluated on the basis of interrogation data and otoscopic data, together with tonal and supra-threshold audiometry. Results show that an increase in hearing threshold from 15 to 30 db had a transient nature and was normalized immediately after the end of the experiment. G.G.

N75-15287 Joint Publications Research Service, Arlington, Va.
CONTROLLED STARVATION AS A BIOLOGICAL FACTOR FAVORING AN INCREASE IN ADAPTABILITY OF THE HUMAN BODY
G. I. Babenkov, V. B. Gurvich, and Ya. Ya. Rudakov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 115-119 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 68-72 (For availability see N75-15271 06-52)

Biological shifts in the human body under the influence of controlled starvation were studied in relation to their therapeutic effects in adaptation diseases. Statistical analysis of changes in body indices during the process adaptation, first to starvation and then to subsequent exogenic feeding, shows that this method intensifies the adaptation possibilities of the human body to prolonged exposure of space flight stress. G.G.

N75-15288 Joint Publications Research Service, Arlington, Va.
ADAPTATION OF THE HUMAN BODY TO THE EARTH'S HEAT REGIME **c53**
V. I. Arabadzhi *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 120-121 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 72-73 (For availability see N75-15271 06-52)

The human body relates its activity to the earth's heat regime through the structural degradation of processed substances. Exchange of entropy with the surrounding medium ensures the necessary body adaptation. Author

N75-15289 Joint Publications Research Service, Arlington, Va.
CHANGE IN BIOELECTRIC ACTIVITY OF SPINAL CORD ROOTS AND IN THE SKELETAL MUSCLES OF DOGS DURING TRANSVERSE ACCELERATION
In its Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 122-128 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 73-76 (For availability see N75-15271 06-52)

Total afferent and efferent fluxes of potentials were studied for the frontal and posterior roots of the spinal cord and the muscles of the rear extremities of dogs under the influence of transverse accelerations. Investigations were carried out in chronic experiments on dogs with preliminary embedding of bipolar electrodes in the roots of the spinal cord and muscles of the rear extremities. A phasic nature of changes in the intensity of afferent and efferent fluxes is noted during exposure to accelerations with marked fluctuations at times of transition from one level to another. Author

N75-15290 Joint Publications Research Service, Arlington, Va.
RESULTS OF CYTOGENETIC INVESTIGATIONS OF THE INFLUENCE OF ACCELERATIONS OF 4-10 g ON MAN
N. N. Bobkova *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 129-132 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 77-78 (For availability see N75-15271 06-52)

Cytogenetic investigations on the influence of transverse accelerations in the range of 4 to 10 g on human chromosomes in vitro, and lasting for 120 to 20 seconds, did not establish any abnormalities of the somatic cells. G.G.

N75-15291 Joint Publications Research Service, Arlington, Va.
PECULIARITIES IN THE CHANGE OF MOTOR ACTIVITY OF RATS UNDER CONDITIONS OF HYPO AND HYPERDYNAMIA **c51**
B. I. Kogan *In its* Space Biol. Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 133-135 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 78-79 (For availability see N75-15271 06-52)

Experiments show that hypo- and hyperdynamia exert a considerable effect on the level of subsequent motor activity of rats. After a period of hypodynamia the motor activity decreases, whereas after hyperdynamia it increases. Statistically reliable differences in the motor activity of rats of different blood lines detected in controls also persisted in the animals under conditions of hypo- and hyperdynamia. Author

N75-15292 Joint Publications Research Service, Arlington, Va.
WATER LOAD AS A METHOD FOR CHANGING THE ORTHOSTATIC REACTION IN MAN AFTER BRIEF HYPODYNAMIA
B. F. Asyamolov, V. S. Panchenko, and I. D. Pestov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 136-140 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 80-82 (For availability see N75-15271 06-52)

The possibility of a decrease in human orthostatic reactions by means of hyperhydration of the body is demonstrated under conditions of ordinary motor activity and especially after brief clinostatic hypodynamia. The greatest effects are obtained 30 minutes after a water load. A direct dependence between excess volume of fluid in the body and the degree of change in pulse rate during orthostatic tests is established, as is a training effect of a number of orthostatic tests after hypodynamia on man's tolerance of vertical posture. Author

N75-15293 Joint Publications Research Service, Arlington, Va.
SECOND SYMPOSIUM ON INFLUENCE OF VIBRATIONS ON THE HUMAN BODY AND THE PROBLEM OF PROTECTION AGAINST VIBRATION
K. V. Frolov, S. V. Petukhov, and B. A. Potemkin *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 141-144 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 82-83 (For availability see N75-15271 06-52)

In connection with the development of high speed transportation, the widespread introduction of machines, tools and mechanisms based on the vibration principle, man every day and systematically is experiencing the action of a wide variety of vibration disturbances which vary in form and intensity. Study of occupational vibrational diseases and contending with them is becoming a serious problem. Great attention is being devoted to the effect of mechanical oscillations on a man-operator as a control link in the man machine system. This symposium was devoted to a discussion of the results of investigations carried out during recent years on these problems in the fields of mechanics and biomechanics, biology and biophysics, medicine and engineering. Author

N75-15294 Institut National de la Sante et de la Recherche Medicale, Paris (France).
SEMICONDUCTOR MICRODETECTOR STUDIES OF CARDIOVASCULAR AND RENAL HEMODYNAMICS Final Report [APPLICATIONS DE MICROCAPTEURS A SEMICONDUCTEUR A L'ETUDE DE L'HEMODYNAMIQUE CARDIOVASCULAIRE ET RENALE]
J. P. Gruenfeld, J. Assailly, and S. Seroussi 10 Dec. 1973 20 p refs In FRENCH; ENGLISH summary
(Contract DGRST-72-7-0252)
Avail: Issuing Activity

A 2.5 mm outer diameter semiconductor detector mounted at the tip of a red Kifa catheter was devised. The detector is easily placed into either the venous coronary sinus or the left renal vein. Cardiac output and myocardial and renal blood flow were measured in dogs with Krypton 85. Kr-85 solution was injected either as a bolus into the left coronary artery or the left renal artery, or by constant infusion into the left ventricle or right atrium. The renal washout curves were recorded simultaneous by external counting and with the semiconductor. They demonstrated identical initial slopes, which validates Kety's theoretical assumptions. These preliminary results open new perspectives in the field of monitoring of cardiac output and provide new insight into the measurement of regional blood flow with in vivo beta counting. Author (ESRO)

N75-15295*# Lockheed Missiles and Space Co., Sunnyvale, Calif.

STARPAHC. PART 1: FINAL SUMMARY REPORT
F. E. Riley Jun. 1974 45 p refs
(Contract NAS9-13170)
(NASA-CR-141459; LMSC-A334458-Pt-1) Avail: NTIS HC $3.75 CSCL 06E

A ground-based demonstration of IMBLMS Space Technology was conducted in a remote geographical area of the U.S. The STARPAHC program, designed to improve the capability for delivering health care to the Papago Indians, is divided into three areas: (1) design and definition; (2) system assembly, test, installation, checkout, and training; and (3) operations and evaluation. The accomplishments achieved in the program are summarized emphasizing system requirements in the areas of communication, specialized medical equipment, display, and computer software. Budgetary history and future cost plans are presented and planned activities are summarized. J.M.S.

N75-15296# Civil Aeromedical Inst., Oklahoma City, Okla.
A SEX COMPARISON OF REASONS FOR ATTRITION OF NON-JOURNEYMAN FAA AIR TRAFFIC CONTROLLERS
John J. Mathews, William E. Collins, and Bart B. Cobb Mar. 1974 17 p refs
(AD-780558; FAA-AM-74-2) Avail: NTIS HC $3.00

Recent A attrition rates showed no sex differences in the proportion of trainees who completed FAA Academy training; however, the percentage of females who subsequently left ATC work was over twice that of male trainees. Reasons for attrition were obtained from job-exit forms, telephone interviews, and a questionnaire. More than 80 per cent of trainee attritions could be accounted for by four reasons: training, family, other employment, and perceived discrimination on the job. Reasons for attrition given at the time of job-exit which cited another job or personal matters lacked statistical reliability during the follow-ups; reasons relating to family matters were comparatively stable. Reasons concerning perceived inadequate training and job discrimination were absent in job-exit data but were mentioned occasionally in the follow-ups. Author

N75-15297# Civil Aeromedical Inst., Oklahoma City, Okla.
EXPERIMENTAL TRAUMA OF OCCIPITAL IMPACTS
Joseph W. Young, Robert G. Fisher, G. Townley Price, and Richard F. Chandler Mar. 1974 16 p refs
(AD-780668; FAA-AM-74-4) Avail: NTIS HC $3.00

Clinical observations, physiological data, and pathological findings are presented on a series of baboons exposed to controlled occipital impacts under local anesthesia. This was accomplished in order to establish trauma mechanisms and compare the relative effects of impact with supported heads and heads capable of responding to impact in a controlled horizontal A-P plane. Fourteen laboratory-conditioned test subjects were surgically instrumented to obtain EEG, bilateral carotid blood flow, and aortic and venous blood pressures. Standard ECG and pulse and respiration rates were recorded in addition to the clinical observations of pupillary responses and corneal reflexes that were documented with high-speed movies. Occipital blows were delivered in the midsagittal plane (parallel to the Frankfort plane) with a pneumatic piston containing load cells and accelerometers. Test results are discussed. Author

N75-15298# Rochester Univ., N.Y. Dept. of Radiation Biology and Biophysics.
BEHAVIORAL METHODS FOR INVESTIGATING ENVIRONMENTAL HEALTH EFFECTS
B. Weiss 1974 25 p refs Presented at the Intern. Symp. of Recent Advan. in the Assessment of the Health Effects of Environ. Pollution, Paris, 24 Jun. 1974
(UR-3490-541; Conf-740638-1) Avail: NTIS HC $3.25

A survey was made of behavioral changes induced by environmental contaminants as well as techniques by which such changes are assessed. Data cover: (1) the screening process during which a search is made for general CNS effects, (2) specific functions that are effected as sensory and motor functions and complex discriminative processes, and (3) human susceptibility and its parameters. Author

N75-15299# Naval Postgraduate School, Monterey, Calif.
SIGNAL PROCESSING AND CHARACTERIZATION OF THE AUDIO EVOKED CORTICAL RESPONSE M.S. Thesis
Russell Eugene McWey Jun. 1974 71 p refs
(AD-784768) Avail: NTIS CSCL 06/16

The audio evoked cortical response to stimuli consisting of audio clicks of varied frequency was analyzed. Analysis of the encephalogram was accomplished through the use of a computer based signal processor which used signal averaging as the primary processing mode to produce a signal for analysis. A unit response wave form was identified and its relationship to the composite response to multiple stimuli was investigated. Using the unit response as a criterion with multiple audio click stimuli, concepts of initial reaction time and integrative processing were identified. Author (GRA)

N75-15300# Naval Aerospace Medical Research Lab., Pensacola, Fla.
ANNOTATED BIBLIOGRAPHY OF REPORTS, SUPPLEMENT NO. 6, 1 JULY 1973 - 30 JUNE 1974
Rita S. McAllister 30 Jun. 1974 30 p refs
(AD-785851) Avail: NTIS CSCL 06/19

Contents: Predicting motivational change and aeronautical adaptability among Navy and Marine Corps aviation trainees; Improving fleet effectiveness of Navy and Marine Corps pilots and flight officers; Analysis of operational functions and unique characteristics of the naval flight officer; Investigation of pilot background factors in naval aviation accidents; The effects of extremely low frequency (E.L.F.) radiation on man; Performance in non-human primates as influenced by low frequency electromagnetic fields; Anthropometric data; Determination of human dynamic response to impact acceleration. GRA

N75-15301# Naval Submarine Medical Research Lab., Groton, Conn.
THE VISUAL EVOKED CORTICAL POTENTIAL AS A MEASURE OF STRESS IN NAVAL ENVIRONMENTS. 3: THE RESPONSE TO PATTERN AND COLOR Medical Progress Report
Jo Ann S. Kinney and Christine L. McKay 19 Mar. 1974 25 p refs
(AD-786322; NSMRL-778; PR-9) Avail: NTIS CSCL 06/19

Previous research has shown that it is possible to isolate a response to pattern from the visual evoked cortical potential. This study investigated the optimum conditions for yielding a pattern response and then applied the pattern response to a test of color vision. The results showed that individuals with normal color vision will give a response to pattern when the pattern is formed of either hue differences or luminance differences. Color defective individuals, however, respond only to luminance differences and not to hue differences that they cannot discriminate. The technique thus can be used as an objective measure of color vision. Author (GRA)

N75-15302# School of Aerospace Medicine, Brooks AFB, Tex.
THRESHOLD DAMAGE EVALUATION OF LONG-TERM EXPOSURES TO ARGON LASER RADIATION Final Report, Sep. 1973 - May 1974
William D. Gibbons Aug. 1974 14 p refs
(AD-786446; SAM-TR-74-29) Avail: NTIS CSCL 06/18

The maculae of rhesus monkeys were exposed to an argon-ion laser operated in the TEMoo continuous wave (CW) mode at a wavelength of 514.5 nm. Damage thresholds (ED50) were determined for exposure times of 0.5, 5, 30, and 120 sec. Retinal damage was assessed at both 1-hr and 24-hr postexposure. With increasing exposure times, a 24-hr threshold criterion resulted in significantly lower threshold values, compared to a 1-hr criterion. Threshold values of 0.5 sec using 1-hr and 24-hr evaluation criteria were determined to be 9.4 and 9.0 mW, respectively; for 5 sec, 6.4 and 5.6 mW; for 30 sec, 5.4 and 2.5 mW; and for 120 sec, 4.4 and 0.54 nW. Author (GRA)

N75-15303# Naval Aerospace Medical Research Lab., Pensacola, Fla.
ELICITATION OF VESTIBULAR SIDE EFFECTS BY REGIONAL VIBRATION OF THE HEAD
James R. Lackner and Ashton Graybiel 29 Jul. 1974 16 p refs
(AD-786288; NAMRL-1204) Avail: NTIS CSCL 06/19

Vestibular side effects including visual and postural illusions, nystagmus, and motion sickness were elicited using a vibrator

applied to different regions of the head. Although a commercially available vibrator (60 Hz, 120 pulses/sec) can elicit side effects, its use was enhanced by varying the vibration frequency and optimizing the stimulus conditions for perception of illusions and elicitation of motion sickness. Both horizontal and vertical nystagmus were elicited, the latter inconsistently. A strong apparent movement (and displacement) of a dimly lighted target that resembled the oculogyral illusion and apparent self-motion were consistently elicited. Motion sickness was readily elicited in some subjects but in other subjects even stimulation during rotation failed. The findings indicate that the use of vibratory stimulation should be exploited to determine whether, in addition to its use in the laboratory as a research device, it has a place in the clinic as a means of evaluating canalicular function. (Modified author abstract) GRA

N75-15304# Virginia Commonwealth Univ., Richmond. Dept. of Biophysics.
EFFECTS OF LOW INTENSITY MICROWAVE RADIATION ON MAMMALIAN SERUM PROTEINS Annual Summary Report, Jul. 1973 - Jun. 1974
Stephen F. Cleary Jun. 1974 84 p refs
(Contract DADA17-72-C-2144)
(AD-785739; ASR-2) Avail: NTIS CSCL 06/18

The effect of 1.7 GHz CW microwave radiation on rabbit serum proteins and blood chemistry were investigated. Intensities of 5 to 25 mW/sq cm for periods of up to two hours were employed in this study. Acrylamide gel electrophoresis was used to compare thermally treated serum proteins with microwave treated samples. Mechanisms for the alteration in drug-induced sleeping time in the Dutch rabbit exposed to 1.7 GHz microwave radiation are discussed. In vitro studies of the thermal denaturation of proteins are described. Author (GRA)

N75-15305# Universidad Peruana de Ciencias Medicas y Biologicas, Lima (Peru). Inst. de Investigaciones de la Altura.
ALVEOLAR GAS EXCHANGE AT ALTITUDE Final Report, 1 Jul. 1973 - 30 Jun. 1974
Julio C. Cruz-Jibata Jun. 1974 29 p refs
(Grant DAMD17-74-G-9383; DA Proj. 3A7-62758-A-827)
(AD-786688) Avail: NTIS CSCL 06/19

Apparent CO Diffusing capacity (DLCO) and alveolar-arterial O2 and CO2 tension differences have been measured at four levels of oxygenation. Seven sea level subjects (SLS) were studied at sea level (SL) and after 10 days of exposure to high altitude (HA), 4350 m. Six high altitude subjects (HAS) were studied at HA. HAS showed larger DLCO than SLS but only breathing normal or low oxygen. On the other hand SLS did not modify their DLCO with altitude exposure, however they showed an increase in membrane diffusing capacity (DM) and a decrease in pulmonary capillary volume (Vc). HAS showed these parameters similar to SLS at HA. A new criteria is presented to estimate O2 diffusing capacity (DLO2) using the equation given by Staub, Bishop and Forster. No statistical significant difference was found between DLO2 and DLCO x 1.23 breathing normal or low oxygen either at SL or at HA. From the A-a oxygen and CO2 differences it is concluded that SLS showed more uneven distribution of ventilation/perfusion ratios (VA/Qc) with altitude exposure. On the other hand, HAS showed a more efficient gas exchange at altitude because of more even VA/Qc ratios and a larger diffusing capacity. (Modified author abstract) GRA

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N75-15306# Advisory Group for Aerospace Research and Development, Paris (France).
ORIENTATION/DISORIENTATION TRAINING OF FLYING PERSONNEL: A WORKING GROUP REPORT
A. J. Benson, ed. Nov. 1974 62 p refs
(AGARD-R-625) Avail: NTIS HC $4.25

Orientation/disorientation training is reviewed of military and civilian aircrew in NATO countries. Deficiencies in current programs are discussed and 24 recommendations made for improvement of ground and in-flight training. Sections of the report review ground based training techniques, the use of familiarization devices, more complex trainers, and aspects of in-flight training. Descriptions of the conduct of ground and in-flight demonstrations, a specimen lecture syllabus, and a specification for a familiarization device, are given. Topics requiring further research or development are identified. Author

N75-15307*# Western Michigan Univ., Kalamazoo.
THE EFFECTS OF CHANGES IN RESPONSE-INDEPENDENT PAY UPON HUMAN MASSETER EMG M.A. Thesis
Tullio J. Proni Dec. 1973 43 p refs
(Grant NGR-23-014-002; Contract N00014-70-A-0183-0001; Grant NSF GB-33620-X1)
(NASA-CR-141276) Avail: NTIS HC $3.75 CSCL 05E

Electromyographic activity of the masseter muscle was recorded in five human subjects who were presented with systematically varied rates of non-contingent pay. Rates of pay were varied between sessions in either a descending or an ascending series. The number of masseter contractions was found to be greater during the descending series than during the ascending series, especially when a descending series of pay changes followed an ascending series. Verbal physical displays of anger and aggression were noted during descending series. These data indicated a possible relation between masseter contractions and aggression. Author

N75-15308*# George Washington Univ. Medical Center, Washington, D.C. Science Communication Div.
STUDIES OF SOCIAL GROUP DYNAMICS UNDER ISOLATED CONDITIONS. OBJECTIVE SUMMARY OF THE LITERATURE AS IT RELATES TO POTENTIAL PROBLEMS OF LONG DURATION SPACE FLIGHT
Sherman P. Vinograd Washington NASA Dec. 1974 288 p refs
(Contract NSR-09-010-027)
(NASA-CR-2496; GW-SCD-74-01R) Avail: NTIS HC $8.75 CSCL 05J

Scientific literature which deals with the study of human behavior and crew interaction in situations simulating long term space flight is summarized and organized. A bibliography of all the pertinent U.S. literature available is included, along with definitions of the behavioral characteristics terms employed. The summarized studies are analyzed according to behavioral factors and environmental conditions. The analysis consist of two matrices. (1) The matrix of factors studied correlates each research study area and individual study with the behavioral factors that were investigated in the study. (2) The matrix of conclusions identifies those studies whose investigators appeared to draw specific conclusions concerning questions of importance to NASA. J.M.S.

N75-15309# Southwest Foundation for Research and Education, San Antonio, Tex.
A PROPOSAL TO STUDY THE ADRENAL CORTEX IN MAINTAINING THE ANDROGENIC-ANABOLIC STATUS IN HUMANS UNDER NORMAL AND STRESSFUL EXPERIMENTAL CONDITIONS
J. W. Goldzieher 31 Jan. 1974 10 p
(Contract F44620-72-C-0030; AF Proj. 9777; AF Proj. 6813)
(AD-784842; AFOSR-74-1340TR) Avail: NTIS CSCL 06/1

An antiserum for each of the three compounds, androstenedione, testosterone, and 11-Beta-hydroxyandrostendione, is now available permitting their measurement by highly sensitive, accurate radiommunoassay. However, the specificity of androstenedione antiserum is not sufficient to allow direct measurement with untreated plasma, thus preliminary chromatography is still required. The chromatography system has been scaled down so that samples obtained from one ml or less of plasma can be processed. There has been no loss in resolution or in sample recovery with the smaller column. Problems associated with the crucial first step extraction of the steroids from plasma have been successfully overcome. The laboratory personnel have gained considerable experience, expertise, and confidence in this period of methods development and are now prepared to perform analyses of many samples in a routine

manner but with the scrupulous attention to detail that these assays demand. Author (GRA)

N75-15310# Naval Aerospace Medical Research Lab., Pensacola, Fla.
DISORIENTATION PHENOMENA IN NAVAL HELICOPTER PILOTS
Felix R. Tormes and Fred E. Guedry, Jr. 29 Jul. 1974 28 p refs
(MF51524005)
(AD-786370; NAMRL-1205) Avail: NTIS CSCL 06/19

The incidence of pilot disorientation in fixed and rotary wing aircraft has been previously investigated, but special orientation problems of naval helicopter pilots engaged in operations at sea and landing on moving platforms have not been previously reported. A questionnaire concerning disorientation was answered anonymously and individually by 104 active naval helicopter pilots. Fifty-six percent indicated one or more episodes of severe disorientation and 8.5 percent indicated having experienced severe disorientation five or more times while piloting helicopters. A number of factors conducive to disorientation were identified. Some precipitating factors appear to be specific to operations over water or over a moving deck, although some of these may well have their counterparts in special operations over land. Other factors are common to land- and sea-based operations and some are common to fixed-wing as well as rotary-wing aircraft. A number of potential countermeasures for various precipitating factors are discussed. Author (GRA)

N75-15311# New Mexico State Univ., University Park. Dept. of Psychology.
SELECTIVE REACTION AND SHORT-TERM MEMORY IN HIGH SPEED INFORMATION PROCESSING Interim Report
Warren H. Teichner Feb. 1974 16 p refs
(Contract F44620-71-C-0072; AF Proj. 9778)
(AD-784878; NMSU-AFOSR-TR-74-2; AFOSR-74-1331TR) Avail: NTIS CSCL 05/10

The study attempted to distinguish experimentally between stimulus acquisition and short-term memory in a task requiring high speed processing of information. Subjects were required to respond selectively to positionally defined arrays of lights and, following their selective reactions, on infrequent occasions to report on the positions of the lights. Analysis of the results suggested that there are differences between selective reactions to pattern and short-term pattern memory with regard to reaction times, accuracy, response blocking, and susceptibility to practice. Author (GRA)

N75-15312# Human Engineering Labs., Aberdeen Proving Ground, Md.
AIR SCOUT NIGHT GOGGLE TEST Final Report
Robert W. Bauer and George D. Pettit Jul. 1974 30 p refs
(AD-785542; HEL-TM-14-74) Avail: NTIS CSCL 06/16

A night target detection/recognition test was developed to follow a daylight air reconnaissance test. The night flights were flown in a modified OH-58 helicopter about 30 meters above ground level by pilots trained to use night vision goggles. Detection/recognition scores and ranges are compared among day flights, night flights with no visual aids for the copilot-observers and night flights with observations aided by night vision goggles. User comments on the total system are reported in some detail. (Modified author abstract) GRA

N75-15313# Louisville Univ., Ky. Performance Research Lab.
BEHAVIORAL EFFECTS OF PROLONGED EXPOSURE TO CONTINUOUS AND INTERMITTENT NOISE Interim Technical Report, 1 Jul. 1971 - 30 Jun. 1972
John D. Repko, Bill R. Brown, and Michel Loeb Jun. 1974 142 p refs
(Contract DAHC19-69-C-0009; DA Proj. 2T0-14501-B-81B)
(AD-785740; ITR-74-29) Avail: NTIS CSCL 06/10

The purpose of this investigation was to assess man's performance in a work situation wherein 90 db continuous and periodic 96 db intermittent noise were separately presented as environmental or work-situation stressors. The present study employed a synthetic-work approach in which several tasks were combined into a multiple-task performance battery (MTPB) consisting of six tasks selected to test both individual- and small-group (crew) performance. The results, showed that the mean percentage of baseline performance was enhanced by a periodic 96 db intermittent noise. On the other hand, since continuous noise may be considered as containing fewer stimulus elements than intermittent noise, it was expected that general performance during continuous noise would be less than during intermittent noise. (Modified author abstract) GRA

N75-15314# URS/Matrix Co., Falls Church, Va.
DEVELOPMENT AND EVALUATION OF VIDEO SYSTEMS FOR PERFORMANCE TESTING AND STUDENT MONITORING Final Report
John Hayes and Robert Pulliam Jul. 1974 214 p refs
(Contract F41609-72-C-0021; AF Proj. 1121)
(AD-786891; AFHRL-TR-74-67) Avail: NTIS CSCL 05/9

Performance testing and student monitoring in individualized training are frequently labor intensive activities. The overall objective of this project was to investigate the feasibility of using low-cost video monitoring and recording equipment to extend the instructor's capabilities in both testing and monitoring activities. Technical training activities at an air force base were evaluated, and testing activities in jet aircraft training, power production, and instructor training were selected for study. The findings are reported and discussed. (Modified author abstract) GRA

N75-15286 Joint Publications Research Service, Arlington, Va.
PECULIARITIES OF THE HUMAN AUDITORY ANALYZER IN A MODIFIED ATMOSPHERE
E. I. Matsnev and A. V. Sergiyenko *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 111-114 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 67-68 (For availability see N75-15271 06-52)

N75-15288 Joint Publications Research Service, Arlington, Va.
ADAPTATION OF THE HUMAN BODY TO THE EARTH'S HEAT REGIME
V. I. Arabadzhi *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 120-121 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 72-73 (For availability see N75-15271 06-52)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N75-15315*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
GENERALIZED ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEM COMPUTER PROGRAM (G189A) CONFIGURATION CONTROL, PHASE 2 Final Report
R. L. Blakely 3 Dec. 1974 19 p refs
(Contract NAS9-13404)
(NASA-CR-141468; MDC-G5579) Avail: NTIS HC $3.25 CSCL 06K

A method for updating and maintaining the G189A program library and documentation for all program users is provided. The effort also involves: (1) providing instruction and recommendations for the use and application of the program, (2) developing new subroutines and the logic required for new simulations, (3) supporting special analyses required by CSD, and (4) conduct studies to define and understand the interaction of the shuttle ECLSS and propose payload ECLSS and ECS designs. Author

N75-15316*# Midwest Research Inst., Kansas City, Mo.
LIQUID COOLED GARMENTS Final Report
Washington NASA Jan. 1975 54 p
(Contract NASw-2454)
(NASA-CR-2509) Avail: NTIS HC $4.25 CSCL 06Q

Liquid cooled garments employed in several applications in

which severe heat is encountered are discussed. In particular, the use of the garments to replace air line cooling units in a variety of industrial processing situations is discussed. Author

N75-15317*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SKYLAB ATMOSPHERIC CONTAMINATION CONTROL
C. D. Ray Nov. 1974 46 p refs
(NASA-TM-X-64900) Avail: NTIS HC $3.75 CSCL 06K

The Skylab contamination removal systems, preflight analysis and testing, and flight results are described. Results indicate that the combination of materials selection, the onboard removal devices, and the offgassing tests proved to be an effective means of controlling spacecraft contaminant levels. Author

N75-15318*# Midwest Research Inst., Kansas City, Mo.
POLAROGRAPHIC OXYGEN SENSORS Final Report
Washington NASA Jan. 1975 26 p
(Contract NASw-2454)
(NASA-CR-2505) Avail: NTIS HC $3.75 CSCL 06K

Polarographic oxygen sensors, which were originally developed for measuring oxygen in space cabin atmospheres, are examined for their use in medical, scientific, and industrial applications. N.E.R.

N75-15319*# Midwest Research Inst., Kansas City, Mo.
BRUSHLESS dc MOTORS Final Report
Washington NASA Jan. 1975 44 p
(Contract NASw-2454)
(NASA-CR-2506) Avail: NTIS HC $3.75 CSCL 06K

Brushless dc motors were intensively developed and tested over several years before qualification as the prime movers for Apollo Spacecraft life support blowers, and for circulating oxygen in the lunar portable life support system. Knowledge gained through prototype development and critical testing has significantly influenced the technology employed, broadened markets and applications, and reduced the cost of present day motors. Author

N75-15320*# Midwest Research Inst., Kansas City, Mo.
HEAT PIPES Final Report
Washington NASA Jan. 1975 52 p
(Contract NASw-2454)
(NASA-CR-2508) Avail: NTIS HC $4.25 CSCL 20M

The development and use of heat pipes are described, including space requirements and contributions. Controllable heat pipes, and designs for automatically maintaining a selected constant temperature, are discussed which would add to the versatility and usefulness of heat pipes in industrial processing, manufacture of integrated circuits, and in temperature stabilization of electronics. M.C.F.

N75-15321*# Life Systems, Inc., Cleveland, Ohio.
SPACECRAFT NITROGEN GENERATION Final Report
R. D. Marshall, J. N. Carlson, J. D. Powell, and K. K. Kacholia Dec. 1974 106 p refs
(Contract NAS2-7057)
(NASA-CR-137576; LSI-ER-198-5) Avail: NTIS HC $5.25 CSCL 06K

Two spacecraft nitrogen (N2) generation systems based on the catalytic dissociation of hydrazine (N2H4) were evaluated. In the first system, liquid N2H4 is catalytically dissociated to yield an N2 and hydrogen (H2) gas mixture. Separation of the N2/H2 gas mixture to yield N2 and a supply of H2 is accomplished using a polymer-electrochemical N2/H2 separator. In the second system, the N2/H2 gas mixture is separated in a two-stage palladium/silver (Pd/Ag) N2/H2 separator. The program culminated in the successful design, fabrication, and testing of a N2H4 catalytic dissociator, a polymer-electrochemical N2/H2 separator, and a two-stage Pd/Ag N2/H2 separator. The hardware developed was sized for an N2 delivery rate of 6.81 kg/d (15lb/day). Experimental results demonstrated that both spacecraft N2 generation systems are capable of producing 6.81 kg/d (15lb/day) of 99.9% pure N2 at a pressure greater than or equal to 1035 kN/m(2) (150 psia). Author

N75-15322# Naval Postgraduate School, Monterey, Calif.
COMPUTER MODELING OF THE ELECTROENCEPHALOGRAM M.S. Thesis
William Eby Stockslager Jun. 1974 95 p refs
(AD-784765) Avail: NTIS CSCL 06/2

A computer modeling of the electroencephalogram (EEG) is described based on current research in the field of EEG analysis using the digital computer. The tegule is defined and possible sources are discussed. The EEG is modeled both in the time and frequency domains. Modeling revealed that patterns of tegules may be detected in the frequency domain. Sinusoids enclosed in a flat-topped cosine envelope are the most commonly observed tegule shape found in processed EEG data. Author (GRA)

N75-15323# Aerospace Guidance and Metrology Center, Newark Air Force Station, Ohio.
THE FUTURE ROLE OF MAN IN THE REPAIR OF NAVIGATION SYSTEMS Final Report
Russell M. Genet 1974 10 p refs
(AD-787219; AGMC-74-025) Avail: NTIS CSCL 15E

Human factors involved in the repair of navigation systems are discussed. The human factors in fault diagnoses, repair action decisions, making repairs, and performance evaluation after repair are discussed. The paper was presented by the author at the Institute of Navigation's 25th Anniversary Symposium at the U.S. Air Force Academy in Colorado in 1971. Author (GRA)

N75-15279 Joint Publications Research Service, Arlington, Va.
INDICES OF THE WORK QUALITY OF A MAN OPERATOR IN SPACESHIP CONTROL
V. V. Lebedev and V. A. Krutov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 68-73 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 42-45 (For availability see N75-15271 06-52)

N75-15284 Joint Publications Research Service, Arlington, Va.
SEMICONDUCTOR THERMOSTATS FOR SPACEFLIGHT BIOLOGICAL INVESTIGATIONS
L. S. Stilbans, Ye. K. Iordanishvili, F. V. Sushkov, A. L. Mashinskiy, E. A. Izupak, and L. M. Gladkikh *In its* Space Biol. and Aerospace Med., Vol. 8, No. 6, 1974 (JPRS-63856) 10 Jan. 1975 p 104-107 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (USSR), v. 8, no. 6, Nov.-Dec. 1974 p 63-65 (For availability see N75-15271 06-52)

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering*.

N75-15324*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
A NEW ADAPTIVE CLASSIFIER USING ITERATIVE FILTERING
Arland L. Actkinson 13 May 1974 25 p refs
(NASA-TM-X-72176; JSC-IN-74-FM-21) Avail: NTIS HC $3.25 CSCL 05B

To cope with signature variability, an algorithm has been defined which will adaptively classify remotely sensed data in the visible and near infrared band. The signal is divided into a space-dependent component and a target-dependent component. The target-dependent component is assumed fixed across the image for each target type. The space-dependent component is estimated iteratively by a weighted, least-squares algorithm. Included are the derivations of the sensor model and the two-dimensional, estimation algorithm. Author

N75-15325*# Ultrasystems, Inc., Newport Beach, Calif.
DEFINITION AND TRADE-OFF STUDY OF RECONFIGURABLE AIRBORNE DIGITAL COMPUTER SYSTEM ORGANIZATIONS Final Report, 9 Oct. 1973 - 8 Nov. 1974
Ralph B. Conn Nov. 1974 301 p refs
(Contract NAS1-12793)
(NASA-CR-132552) Avail: NTIS HC $9.25 CSCL 09B

A highly-reliable, fault-tolerant reconfigurable computer system for aircraft applications was developed. The development and application reliability and fault-tolerance assessment techniques are described. Particular emphasis is placed on the needs of an all-digital, fly-by-wire control system appropriate for a passenger-carrying airplane. Author

N75-15326*# National Environmental Satellite Service, Washington, D.C.
NIMBUS-5 SOUNDER DATA PROCESSING SYSTEM. PART 1: MEASUREMENT CHARACTERISTICS AND DATA REDUCTION PROCEDURES Final Report
W. L. Smith, H. M. Woolf, P. G. Abel, C. M. Hayden, M. Chalfant, and N. Grody Jun. 1974 106 p refs
(NASA Order S-70249-AG)
(NASA-CR-141251; NOAA-TM-NESS-59-Pt-1) Avail: NTIS HC $5.25 CSCL 05B

This report describes the data processing system developed to obtain various meteorological variables from infrared and microwave radiometric data obtained from the Nimbus-5 spacecraft. The meteorological parameters deduced from the radiance data include: (1) surface temperature, (2) vertical temperature profile, (3) precipitable water content, (4) total outgoing long-wave radiation flux, and (5) vertical cloud distribution. The data system enables the derivations to be made on a global basis independent of contemporary conventional data. Determinations are made with horizontal resolutions of 500 km and 150 km to satisfy the requirements for the large scale numerical forecast experiments and the fine-scale weather analysis-forecast studies being conducted. Author

N75-15327# University of Southern Calif., Los Angeles. Image Processing Inst.
IMAGE PROCESSING RESEARCH Semiannual Technical Report, 1 Mar. - 31 Aug. 1974
William K. Pratt 30 Sep. 1974 130 p refs
(Contract F08606-72-C-0008)
(AD-786176; USCIP-540) Avail: NTIS CSCL 09/2

The research program has as its primary purpose the analysis and development of techniques and systems for efficiently generating, processing, transmitting, and displaying visual images and two dimensional data arrays. Research is oriented toward digital processing and transmission systems. Five task areas are reported on: (1) Image Coding Projects: the investigation of digital bandwidth reduction coding methods; (2) Image Restoration and Enhancement: the improvement of image fidelity and presentation format; (3) Image Data Extraction Projects: the recognition of objects within pictures and quantitative measurement of image features; (4) Image Analysis Projects: the development of quantitative measures of image quality and analytic representation; (5) Image Processing Support Projects: development of image processing hardware and software support systems. (Modified author abstract) GRA

N75-15328# Bunker-Ramo Corp., Westlake Village, Calif. Electronic Systems Div.
RADAR IMAGE PROCESSING SYSTEM Final Report, May 1972 - Mar. 1974
Bill Wilkenson May 1974 52 p
(Contract F30602-72-C-0337; AF Proj. 1153)
(AD-786421; RADC-TR-74-134) Avail: NTIS CSCL 17/9

This report contains a description of a radar data processing system that was developed for use with the ARRES (Automatic Radar Reconnaissance Exploitation System) radar change detector. It describes the implementation of a BR90 display and PDP-11 computer to achieve this end. Additionally, the report contains user procedures for system operation. The detailed program descriptions are contained in a technical manual under separate cover entitled Radar Image Processing System, Volume 1. Author (GRA)

N75-15356 Academy of Sciences (USSR), Moscow.
GAMES TAUGHT ON STOCHASTIC AUTOMATIC MACHINES
A. A. Yershov and A. S. Poznyak *In its* Probl. of Cybernetics 1974 p 133-139 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

N75-15357 Academy of Sciences (USSR), Moscow.
LIMITING BEHAVIOR OF ONE CLASS OF STOCHASTIC AUTOMATIC MACHINES WITH ALTERNATE STRUCTURE
Yu. A. Flerov *In its* Probl. of Cybernetics 1974 p 140-145 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

N75-15359 Academy of Sciences (USSR), Moscow.
INTERACTION OF PROBABILITY AND ADAPTIVE AUTOMATIC MACHINES
D. P. Derevitskiy and N. K. Zlatorunskiy *In its* Probl. of Cybernetics 1974 p 152-154 ref In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N75-15329*# North Carolina State Univ., Raleigh.
METHOD OF CHARACTERISTICS CALCULATIONS AND COMPUTER CODE FOR MATERIALS WITH ARBITRARY EQUATIONS OF STATE AND USING ORTHOGONAL POLYNOMIAL LEAST SQUARE SURFACE FITS] Final Report
Tien Sun Chang 29 Oct. 1974 225 p
(Grant NGL-34-002-084)
(NASA-CR-141949) Avail: NTIS HC $7.25 CSCL 12A

A numerical scheme using the method of characteristics to calculate the flow properties and pressures behind decaying shock waves for materials under hypervelocity impact is developed. Time-consuming double interpolation subroutines are replaced by a technique based on orthogonal polynomial least square surface fits. Typical calculated results are given and compared with the double interpolation results. The complete computer program is included. Author

N75-15330*# Washington Univ., St. Louis, Mo. Communications Group.
A SOFTWARE IMPLEMENTATION OF A SATELLITE INTERFACE MESSAGE PROCESSOR
Margaret A. Eastwood and Lester F. Eastwood, Jr. Dec. 1974 60 p refs
(Grants NGR-26-008-054; NSF EC-38871)
(NASA-CR-141280; Memo-74/2) Avail: NTIS CSCL 09B

Network control software was designed for a computer network in which some nodes are linked by a communications satellite channel, and specialized processors at each node are responsible for message switching and network control. Control

software oversees the following network operations: (1) keeps track of message queues and switching functions, (2) tags messages with addresses and insures that they arrive error-free, and (3) avoids disruption of network functions where a node or communications line is inoperative. For efficiency, The packet reservation scheme for computer communication by satellite, was implemented for dynamically allocating time on a satellite channel. Author

N75-15331*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PATTERN RECOGNITION ALGORITHM USING TEMPORAL DATA
20 May 1974 4 p
(NASA-TM-X-72175; JSC-FM84-(74-143)) Avail: NTIS HC $3.25 CSCL 09B

The value of a previously classified image is discussed with the use of spectral and temporal information. A probability theory is presented of a signal X, belonging to class pi sub i. M.C.F.

N75-15332*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE APPLICABILITY AND EFFECTIVENESS OF CLUSTER ANALYSIS
D. S. Ingram (IBM) and A. L. Actkinson 4 May 1973 32 p refs
(NASA-TM-X-72177; JSC-07907; JSC-IN-73-FM-53) Avail: NTIS HC $3.75 CSCL 09B

An insight into the characteristics which determine the performance of a clustering algorithm is presented. In order for the techniques which are examined to accurately cluster data, two conditions must be simultaneously satisfied. First the data must have a particular structure, and second the parameters chosen for the clustering algorithm must be correct. By examining the structure of the data from the CI flight line, it is clear that no single set of parameters can be used to accurately cluster all the different crops. The effectiveness of either a noniterative or iterative clustering algorithm to accurately cluster data representative of the CI flight line is questionable. Thus extensive a prior knowledge is required in order to use cluster analysis in its present form for applications like assisting in the definition of field boundaries and evaluating the homogeneity of a field. New or modified techniques are necessary for clustering to be a reliable tool. Author

N75-15333*# Rice Univ., Houston, Tex. Inst. for Computer Services and Applications.
EARTH RESOURCES DATA ANALYSIS PROGRAM, PHASE 2 Final Report, Jun. 1973 - May 1974
Jun. 1974 38 p ref
(Contract NAS9-12776)
(NASA-CR-141477; Rept-275-025-FP2) Avail: NTIS HC $3.75 CSCL 09B

The efforts and findings of the Earth Resources Data Analysis Program are summarized. Results of a detailed study of the needs of EOD with respect to an applications development system (ADS) for the analysis of remotely sensed data, including an evaluation of four existing systems with respect to these needs are described. Recommendations as to possible courses for EOD to follow to obtain a viable ADS are presented. Algorithmic development comprised of several subtasks is discussed. These subtasks include the following: (1) two algorithms for multivariate density estimation; (2) a data smoothing algorithm; (3) a method for optimally estimating prior probabilities of unclassified data; and (4) further applications of the modified Cholesky decomposition in various calculations. Little effort was expended on task 3, however, two reports were reviewed. Author

N75-15334# California Univ., Livermore. Lawrence Livermore Lab.
METHOD FOR COMPUTER SIMULATION OF PROBLEMS IN SOLID MECHANICS AND GAS DYNAMICS IN THREE DIMENSIONS AND TIME
M. L. Wilkins, R. E. Blum, E. Cronshagen, and P. Grantham 24 Apr. 1974 87 p refs
(Contract W-7405-eng-48)
(UCRL-51574) Avail: NTIS HC $4.75

Details are given for a versatile computer program that employs finite element and finite difference techniques to describe complex physical phenomena in three dimensions and time. Applications include problems in gas dynamics, elasticity, dynamic plasticity, fracture, and thermal conduction. The main features of the program are illustrated by a calculation that determines the thermal-shock stresses in a stator blade of a gas turbine engine. Appendices present an outline of SOLID SAP, a complete mathematical development of HEMP 3D, a comparison between finite difference and finite element methods, and descriptions of subroutines for discretizing, for display, and for calculation of three-dimensional thermal diffusion. Author (NSA)

N75-15335# Naval Weapons Lab., Dahlgren, Va.
YAW SONDE AND RADAR DATA REDUCTION TO OBTAIN AERODYNAMIC COEFFICIENTS
Martin Becker Sep. 1974 125 p refs
(AD-787074; NWL-TR-3073) Avail: NTIS CSCL 19/4

Two computer models developed by the Armament System Department of the General Electric Corporation, one for reducing radar data (HEEVE) and the other for determining aerodynamic coefficients from Yaw Sonde data (ANGLES), are described. The mathematical techniques are discussed and the fundamental equations used in these programs are shown. An input-output guide is provided for both models. The results of fitting a theoretical test case generated from a six-degree-of-freedom model is discussed. (Modified author abstract) GRA

N75-15336# RAND Corp., Santa Monica, Calif.
EXPERIENCES IN DESIGNING A DATA RETRIEVAL CAPABILITY FOR A LARGE DATA BASE
L. H. Heiser Apr. 1974 15 p refs
(AD-786712; P-5113) Avail: NTIS CSCL 09/2

DATAR is a package of subroutines that provide data retrieval capabilities for a large weather data base. The design of this package was a valuable learning experience for the author. Questions of portability had to be resolved since the package must run on several different computers. Questions of interface arose since DATAR would be imbedded in other programs. Also, it was desirable to have changes to the subroutines be transparent to the user. And the list goes on. It is the author's intent to discuss the design of DATAR and to share the learning experiences. Author (GRA)

N75-15337# Singer Co., Sunnyvale, Calif. Simulation Products Div.
RADAR IMAGE GENERATION SOFTWARE Final Report
B. Yates and Dennis Yeo May 1974 33 p
(Contract N61339-73-C-0167)
(AD-786778; NAVTRAEQUIPC-73-C-0167-2) Avail: NTIS CSCL 17/9

This report describes the development of an elevation interpolation mathematical model and a FORTRAN radar processor. The results of the development will enable the Naval Training Equipment Center to evaluate the Singer method of elevation encodement and processing as incorporated in Singer digital radar landmass simulator (DRLMS) systems. The objective of the development is to provide a means for comparative analysis of the various methods of elevation encodement and processing. (Modified author abstract) GRA

N75-15349 Academy of Sciences (USSR), Moscow.
ALGORITHM FOR THE RANDOM SEARCH OF THE EXTREME IN FUNCTIONAL SPACE
O. Yu. Kulchitskiy *In its* Probl. of Cybernetics 1974 p 91-93 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

N75-15351 Academy of Sciences (USSR), Moscow.
AN ALGORITHM FOR IDENTIFYING NONLINEAR SYSTEMS
B. V. Kromskiy and R. M. Yusupov *In its* Probl. of Cybernetics 1974 p 100-104 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

N75-15353 Academy of Sciences (USSR), Moscow.
INVESTIGATION OF TWO-LEVEL ADAPTATION ALGORITHM

B. R. Andriyevskiy, D. P. Derevitskiy, and S. A. Losev *In its* Probl. of Cybernetics 1974 p 109-112 refs In RUSSIAN (For availability see N75-15338 06-63)
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N75-15354 Academy of Sciences (USSR), Moscow.
FINITE-CONVERGENT ALGORITHMS IN A PROBLEM OF ADAPTIVE REGULATOR CONSTRUCTION
G. S. Aksenov and V. N. Fomin *In its* Probl. of Cybernetics 1974 p 113-121 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

N75-15362 Academy of Sciences (USSR), Moscow.
RECURRENT ALGORITHMS IN THE SELF-INSTRUCTION OF SAMPLE DISCERNMENT
Yu. I. Ingster *In its* Probl. of Cybernetics 1974 p 162-167 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

N75-15368 Academy of Sciences (USSR), Moscow.
ANALYSIS OF ADAPTIVE ALGORITHMS OF DATA REDUCTION IN INFORMATION SYSTEMS
G. V. Gerkhen-Gubanov, Ye. P. Derevitskiy, V. Ye. Rokhchin, and O. A. Chekmarev *In its* Probl. of Cybernetics 1974 p 203-206 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

N75-15369 Academy of Sciences (USSR), Moscow.
ALGORITHM FOR ADAPTIVE CONTROL OF ALTERNATE CURRENT VALVE TRANSFORMERS
A. G. Zilberg, B. D. Lyubachevskiy, and L. P. Smolnikov *In its* Probl. of Cybernetics 1974 p 207-211 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

N75-15370 Academy of Sciences (USSR), Moscow.
ADAPTIVE ALGORITHM OF STOCHASTIC APPROXIMATION FOR OPTIMIZATION OF DYNAMIC SYSTEMS
L. B. Dobrin and A. S. Shalygin *In its* Probl. of Cybernetics 1974 p 212-216 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

N75-15377 Academy of Sciences (USSR), Moscow.
USING INSTRUCTION ALGORITHMS FOR CONTROLLING ENERGY SUBSTANCES
V. I. Ageyev and V. G. Shlopak *In its* Probl. of Cybernetics 1974 p 244-247 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

62 COMPUTER SYSTEMS

Includes computer networks.

No abstracts in this category.

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N75-15338 Academy of Sciences (USSR), Moscow.
PROBLEMS OF CYBERNETICS. ADAPTIVE SYSTEMS
S. I. Samoylenko, ed. et al 1974 257 p refs In RUSSIAN
Copyright. Avail: Issuing Activity

The conference on the theory of adaptive control systems in cybernetics is reported. Topics discussed include: general problems of the theory, development and investigation of adaptation algorithms, analysis and synthesis of adaptive automata, and systems of pattern recognition. For individual titles, see N75-15339 through N75-15378.

N75-15339 Academy of Sciences (USSR), Moscow.
ALGORITHMS OF ADAPTIVE SYSTEMS OPERATION
Ya. Z. Tsypkin *In its* Probl. of Cybernetics 1974 p 5-30 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

Methods of constructing various teaching algorithms are presented along with the formulation of general conditions of their convergence. The possibility was examined of constructing teaching algorithms under transitional conditions, and the directions of further algorithm generalizations are briefly evaluated. Transl. by M.J.S.

N75-15340 Academy of Sciences (USSR), Moscow.
ADAPTIVE SYSTEMS AND AUTOMATIC MACHINES
V. G. Sragovich *In its* Probl. of Cybernetics 1974 p 31-37 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

A formal determination is presented of the adaptive control system concept, based on the presentation of control in a random process, and the controlling system is in the form of generalized automata. The theory of adaptive control systems is discussed along with its development. Transl. by M.J.S.

N75-15341 Academy of Sciences (USSR), Moscow.
REVIEW OF INVESTIGATIONS ON ADAPTIVE SYSTEMS AT THE COMPUTER CENTER OF THE USSR ACADEMY OF SCIENCES
Yu. A. Flerov *In its* Probl. of Cybernetics 1974 p 38-45 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

Adaptative control of random processes with unknown probability characteristics is discussed. Other topics discussed include: stochastic approximation, Markov processes, learning systems, automata theory, adaptive control systems, mathematical games, and self-adaptive control systems. Transl. by M.J.S.

N75-15342 Academy of Sciences (USSR), Moscow.
ONE METHOD OF CONSTRUCTING ADAPTIVE CONTROL OF A LINEAR DYNAMIC OBJECT UNDER VERY AMBIGUOUS CONDITIONS
V. A. Yakubovich *In its* Probl. of Cybernetics 1974 p 46-61 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

A method was developed for synthesizing adaptive control algorithms based on the use of finite-convergent algorithms for solving infinite inequality systems. Dynamic problems are presented in which the parameters of the system and of the external effect are unknown. Computer models for self-instruction processes were constructed. Transl. by M.J.S.

N75-15343 Academy of Sciences (USSR), Moscow.
ONE CLASS OF ADAPTIVE SYSTEMS
D. P. Derevitskiy and A. L. Fradkov *In its* Probl. of Cybernetics 1974 p 62-68 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

The Markov class of adaptive control systems is described as a system with single-step object conditions. The adaptation processes in such systems are Markov processes with discrete time. Examples are presented which show that a series of known adaptive systems is contained in the framework of the proposed control system. Transl. by M.J.S.

N75-15344 Academy of Sciences (USSR), Moscow.
ONE METHOD OF CONSTRUCTING ADAPTIVE CONTROL FOR A DYNAMIC OBJECT
B. D. Lyubachevskiy *In its* Probl. of Cybernetics 1974 p 69-74 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

A method is presented in which the parameters of a control system are made more precise in the functioning process. This method requires parameter values at which some correlation (of the inequality type) can be made and can connect these parameters

with dynamic variables. For the case of a linear system, two algorithms are presented, based on this method and on the method of finite-converging algorithms for solutions of inequality systems. Transl. by M.J.S.

N75-15345 Academy of Sciences (USSR), Moscow.
OPTIMAL FINITE-CONVERGENT ALGORITHMS FOR ADAPTIVE IDENTIFICATION OF LINEAR DYNAMIC OBJECTS
A. V. Timofeyev *In its* Probl. of Cybernetics 1974 p 75-78 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

Optimal recurrent algorithms of epsilon identification are presented along with the conditions for their precise identification. The solution to the system identification is based on the reformulation in terms of a solution for a calculating system of convex inequalities. Linear differential and differential equations are also discussed. Transl. by M.J.S.

N75-15346 Academy of Sciences (USSR), Moscow.
ANALYSIS OF THE DYNAMICS OF SOME ADAPTATION ALGORITHMS
D. P. Derevitskiy and A. L. Fradkov *In its* Probl. of Cybernetics 1974 p 79-84 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

An approach was investigated for analyzing the dynamics of adaptation algorithms by replacing an equation with a simpler model of that equation. Two such model equations were used for adaptive identification of static objects. It was found that in problems of adaptive identification, finite-convergent algorithms can be used for solving infinite inequality systems.
Transl. by M.J.S.

N75-15347 Academy of Sciences (USSR), Moscow.
AN ADAPTIVE METHOD FOR CONSTRUCTING CONTROLS FOR COMPLETELY CONTROLLABLE SIMPLE SYSTEMS
G. S. Aksenov *In its* Probl. of Cybernetics 1974 p 85-88 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

The problem of constructing controls for a stabilizing system was investigated. It was found that although the coefficients of the equation describing the system's condition are unknown, the possibility exists for observing the system's output at a given moment of time. A recurrent procedure is presented for constructing scalar control, guaranteeing the stability of a multidimensional linear system. Transl. by M.J.S.

N75-15348 Academy of Sciences (USSR), Moscow.
THE ROBBINS-MONROE PROCESS IN THE CASE OF SEVERAL RADICALS
T. P. Krasulina *In its* Probl. of Cybernetics 1974 p 89-90 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

Stochastic approximation processes and algorithms, and their applicability to automatic learning systems were investigated. It was found that the Robbins-Monroe process converges to the roots of the regression function. Transl. by M.J.S.

N75-15349 Academy of Sciences (USSR), Moscow.
ALGORITHM FOR THE RANDOM SEARCH OF THE EXTREME IN FUNCTIONAL SPACE **c61**
O. Yu. Kulchitskiy *In its* Probl. of Cybernetics 1974 p 91-93 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

Several algorithm varieties are presented in which only values of the function are used in the search process. Satisfactory conditions were investigated for their convergence. Hilbert space, random errors, and random variables are also discussed.
Transl. by M.J.S.

N75-15350 Academy of Sciences (USSR), Moscow.
INFORMATIONAL APPROACH TO THE ADAPTIVE IDENTIFICATION PROBLEM
I. Sh. Torgovitskiy *In its* Probl. of Cybernetics 1974 p 94-99 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

Adaptive identification of static and dynamic systems was accomplished during their normal use. Other topics discussed included algorithms, vectors, limits, minimization, differential equations, and information theory. It was found that the optimal limitations, superposable on input parameters, were limitations on the vector, and not on its separate components.
Transl. by M.J.S.

N75-15351 Academy of Sciences (USSR), Moscow.
AN ALGORITHM FOR IDENTIFYING NONLINEAR SYSTEMS **c61**
B. V. Kromskiy and R. M. Yusupov *In its* Probl. of Cybernetics 1974 p 100-104 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

An algorithm based on the phase representation of functioning processes is presented for identifying nonlinear adaptive systems. It was found that the results can be used for correcting adaptive system operators in accordance with given quality criteria. Transl. by M.J.S.

N75-15352 Academy of Sciences (USSR), Moscow.
THREE HEURISTIC SCHEMES FOR PRESENTING MULTIVARIABLE FUNCTIONS **c64**
A. N. Lapin *In its* Probl. of Cybernetics 1974 p 105-108 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

Modular functions which can be in the form of algorithms (programs for a computer) or in the form of a representative table are discussed. Each scheme represents some modification of known approaches to instructional problems. Other topics discussed include Euclidean geometry, quadratic coefficients, approximation, and mathematical trees. Transl. by M.J.S.

N75-15353 Academy of Sciences (USSR), Moscow.
INVESTIGATION OF TWO-LEVEL ADAPTATION ALGORITHM **c61**
B. R. Andriyevskiy, D. P. Derevitskiy, and S. A. Losev *In its* Probl. of Cybernetics 1974 p 109-112 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

One method for accelerating the convergence of adaptation algorithms was examined. The method consists of introducing a second level into the algorithm, in which the approximation of the minimized functional gradient is accomplished during the adaptation process. Results are presented of experiments supporting the accelerated convergence of the proposed algorithm. Transl. by M.J.S.

N75-15354 Academy of Sciences (USSR), Moscow.
FINITE-CONVERGENT ALGORITHMS IN A PROBLEM OF ADAPTIVE REGULATOR CONSTRUCTION **c61**
G. S. Aksenov and V. N. Fomin *In its* Probl. of Cybernetics 1974 p 113-121 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

Recurrent procedures are presented which describe the process of regulator adaptation in the problem of controlling linear continuous systems. From the mathematical point of view, this is done by reducing this problem to one of finding a solution for an infinite system of linear inequalities. Transl. by M.J.S.

N75-15355 Academy of Sciences (USSR), Moscow.
BASES OF THE AUTOMATA THEORY OF RANDOM SEARCH
L. A. Rastrigin and K. K. Ripa *In its* Probl. of Cybernetics 1974 p 123-132 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

Basic algorithms were examined for the random search of extremum values of multivariable functions. The concept of algorithms as probability automata was investigated, and the problem of synthesizing local-optimal search algorithms was solved by using the automata approach. Transl. by M.J.S.

N75-15356 Academy of Sciences (USSR), Moscow.
GAMES TAUGHT ON STOCHASTIC AUTOMATIC MACHINES **c60**
A. A. Yershov and A. S. Poznyak *In its* Probl. of Cybernetics

1974 p 133-139 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

Algorithms are presented which allow the synthesis of stochastic learning automata possessing the asymptotic optimum during time of operation for game situations and problems of linear stochastic programming. Other topics discussed include game theory, two-person matrix games, and automata theory.
Transl. by M.J.S.

N75-15357 Academy of Sciences (USSR), Moscow.
LIMITING BEHAVIOR OF ONE CLASS OF STOCHASTIC AUTOMATIC MACHINES WITH ALTERNATE STRUCTURE **c60**
Yu. A. Flerov *In its* Probl. of Cybernetics 1974 p 140-145 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

Limit distributions are presented of the probabilities for activity in the simplest linear automata with alternate structure. Other topics discussed include input and output signals, random variables, and mathematical matrices and vectors.
Transl. by M.J.S.

N75-15358 Academy of Sciences (USSR), Moscow.
PRIOR INFORMATION AND ADAPTIVE SYSTEMS
Yu. M. Kozlov *In its* Probl. of Cybernetics 1974 p 146-151 refs In RUSSIAN (For availability see N75-15338 06-63)

The relation between prior information and the structure of the information processing system was examined. The fundamental value was investigated of theoretical group methods for some problems of the teaching theory and of artificial intelligence, and the importance of these methods was determined by analyzing the basic group theory concepts. The basic principles are presented for using the theoretical-group approach for the problem of visual perception and instruction in technical and biological systems.
Transl. by M.J.S.

N75-15359 Academy of Sciences (USSR), Moscow.
INTERACTION OF PROBABILITY AND ADAPTIVE AUTOMATIC MACHINES **c60**
D. P. Derevitskiy and N. K. Zlatorunskiy *In its* Probl. of Cybernetics 1974 p 152-154 ref In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

A general algorithm is presented for changing transitional probabilities of adaptive automata. It was found that Moore's two probability automata interact if the output of the first is connected with the input of the second, and the output of the second with the input of the first, and that the corresponding sets of signals coincide.
Transl. by M.J.S.

N75-15360 Academy of Sciences (USSR), Moscow.
OPTIMAL SYNTHESIS PROBLEM OF ONE CLASS OF DISCERNING SYSTEMS
V. A. Kovalevskiy, V. G. Galochkin, and L. S. Korovyakina *In its* Probl. of Cybernetics 1974 p 155-158 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

Discerning systems such as correlation reading automata are discussed. The problem of synthesizing an optimal combination of standards for the reading automata was investigated, and a series of computer programs was developed for solving it. Other topics discussed included generalized gradient slope, probability theory, and iteration.
Transl. by M.J.S.

N75-15361 Academy of Sciences (USSR), Moscow.
SELF-INSTRUCTION ON THE DISCERNMENT OF SAMPLES ACCORDING TO A METHOD OF MIXED DISTRIBUTIONS **c64**
V. I. Vasilyev and V. V. Konovalenko *In its* Probl. of Cybernetics 1974 p 159-161 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

A method of mixed distributions for pattern recognition was investigated. It was shown that during the realization of the compact hypothesis: (1) the algorithms of this method do not require information about the quantity of abstract samples; and (2) they can be organized in the form of iterative procedures which do not require any additional information except for the assignment of a space for signs and a mixed learning sequence.
Transl. by M.J.S.

N75-15362 Academy of Sciences (USSR), Moscow.
RECURRENT ALGORITHMS IN THE SELF-INSTRUCTION OF SAMPLE DISCERNMENT **c61**
Yu. I. Ingster *In its* Probl. of Cybernetics 1974 p 162-167 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

The criteria and algorithms were investigated of two methods for solving the problems of self-instruction pattern recognition. The proposed algorithms take into consideration the covariance of signs and are based on recurrent algorithms for analyzing natural vectors and natural values of covariant matrices.
Transl. by M.J.S.

N75-15363 Academy of Sciences (USSR), Moscow.
TAXONOMIC CODING OF MULTICHANNEL SPECIMENS **c64**
A. N. Radchenko *In its* Probl. of Cybernetics 1974 p 168-171 In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

A single sample is represented in metric space as a combination of strongly unfocused vectors. This was achieved by scanning, which transforms input information into a sequence of vectors and gives them an orderly relationship. It was found that the larger the space between points of this trajectory, and the larger the number of unfocused vectors with which the single sample is presented, the simpler and more reliable the identification.
Transl. by M.J.S.

N75-15364 Academy of Sciences (USSR), Moscow.
ONE APPROACH TO CRITERIA DESIGNATION IN PROBLEMS OF SELF-INSTRUCTION OF LONG WORD CLASSIFICATION **c82**
A. N. Lapin *In its* Probl. of Cybernetics 1974 p 172-174 refs In RUSSIAN (For availability see N75-15338 06-63)
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The stages were investigated for selecting primary signs in problems of perception of long signals with unknown characteristics. The procedure is based on construction of a mathematical tree, and the example of music discrimination was used.
Transl. by M.J.S.

N75-15365 Academy of Sciences (USSR), Moscow.
SOLUTION TO THE PROBLEM OF OBSERVING AND IDENTIFYING DISTURBING EFFECTS BY AN INVERSE SENSITIVITY METHOD **c64**
R. M. Yusupov and Yu. Ya. Ostov *In its* Probl. of Cybernetics 1974 p 175-186 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

Disturbing effects with unknown statistical characteristics and their relation to the automatic control object are described by using a system of nonlinear differential equations. Iteration, Runge-Kutta method, and matrices are also discussed.
Transl. by M.J.S.

N75-15366 Academy of Sciences (USSR), Moscow.
SYNTHESIS OF A MANAGING INSTALLATION FOR PRODUCTIVE COMPLEXES, BASED ON THE THEORY OF SAMPLE DISCERNMENT **c09**
I. Sh. Torgovitskiy and M. S. Kogan *In its* Probl. of Cybernetics 1974 p 187-195 refs In RUSSIAN (For availability see N75-15338 06-63)
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A control installation was examined, which in its set scheme is characterized by a collection of disturbing effects, controlling effects, and output parameters appearing as work indicators. Other topics discussed include root-mean-square errors, recurrent algorithms, functionals, prior information, adaptive control, and pattern recognition.
Transl. by M.J.S.

N75-15367 Academy of Sciences (USSR), Moscow.
ADAPTIVE TEMPERATURE CONTROL OF THE POLYMERIZATION PROCESS IN THE SYNTHETIC RUBBER PRODUCTION **c37**

G. S. Aksenov, V. M. Breytman, A. V. Zak, B. D. Lyubachevskiy, G. D. Penev, B. A. Perlin, and V. A. Yakubovich *In its* Probl. of Cybernetics 1974 p 196-202 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

A recurrent finite-converging algorithm for solving a system of inequalities was used for constructing an adaptive control algorithm for a kinetic model of the synthetic rubber polymerization process. The results are presented of computer experiments on modelling the work of control algorithms. Transl. by M.J.S.

N75-15368 Academy of Sciences (USSR), Moscow.
ANALYSIS OF ADAPTIVE ALGORITHMS OF DATA REDUCTION IN INFORMATION SYSTEMS **c61**
G. V. Gerkhen-Gubanov, Ye. P. Derevitskiy, V. Ye. Rokhchin, and O. A. Chekmarev *In its* Probl. of Cybernetics 1974 p 203-206 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

Results are presented of a comparative analysis of the effectiveness of a series of simple algorithms for the reduction of the zero and first orders. Random processes and differentiation are also discussed. Transl. by M.J.S.

N75-15369 Academy of Sciences (USSR), Moscow.
ALGORITHM FOR ADAPTIVE CONTROL OF ALTERNATE CURRENT VALVE TRANSFORMERS **c61**
A. G. Zilberg, B. D. Lyubachevskiy, and L. P. Smolnikov *In its* Probl. of Cybernetics 1974 p 207-211 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

On the basis of recurrent finite-converging algorithms (used for solving systems of inequalities), an adaptive method was developed for controlling alternating current valve transformers. The method was studied on a model with the aid of a computer. It was found that the described model indicates the effectiveness of the method and the possibility of its use for checking under real conditions. Transl. by M.J.S.

N75-15370 Academy of Sciences (USSR), Moscow.
ADAPTIVE ALGORITHM OF STOCHASTIC APPROXIMATION FOR OPTIMIZATION OF DYNAMIC SYSTEMS **c61**
L. B. Dobrin and A. S. Shalygin *In its* Probl. of Cybernetics 1974 p 212-216 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

The problem of determining optimal parameters of a controlled system was examined. For solving this problem, an algorithm of the stochastic approximation type was proposed, the structure and parameters of which change in the optimization process according to the measure of information accumulation. It was found that the examined algorithm: (1) possesses high speed of convergence into the small surroundings of the optimum point; (2) can change its own structure, (3) can adapt its structure to concrete search conditions, and (4) requires relatively little prior information for its own construction. Transl. by M.J.S.

N75-15371 Academy of Sciences (USSR), Moscow.
ADAPTIVE MODELING AND OPTIMIZATION OF NONLINEAR DYNAMIC SYSTEMS
G. A. Kryzhanovskiy, V. A. Nikitin, and V. A. Solodukhin *In its* Probl. of Cybernetics 1974 p 217-221 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

An automatic system was investigated for adaptive construction of mathematical models of nonlinear dynamic systems. The goal was subsequent optimization of these systems, taking into account the different needs for dynamic systems.
Transl. by M.J.S.

N75-15372 Academy of Sciences (USSR), Moscow.
A PERCEPTRON AS A SENSORY PART OF A SHIP'S CONTROL SYSTEMS
N. M. Pinevskiy and P. I. Vasilyev *In its* Probl. of Cybernetics 1974 p 222-226 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

The use of perceptrons in a ship's automated control system was examined along with the Robbins-Monroe discrete procedure. The matrix elements of adaptation coefficients for determined input events (known causal-inquiry connections) and the convergence of adaptation procedures are also discussed.
Transl. by M.J.S.

N75-15373 Academy of Sciences (USSR), Moscow.
OPTIMIZATION OF THE TRAJECTORY OF AUTOMATIC DEVICE MOVEMENT **c70**
A. F. Yeremin and I. S. Zilitinkevich *In its* Probl. of Cybernetics 1974 p 227-230 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

A simplified surface model and an optimal trajectory (according to time) for safe movement of an automatic robot device in a given region were constructed by using the modified adaptive Bellman algorithm (for solving problems about movements). It was found that for a finite number of obstacles, it is always possible to determine an optimal trajectory along the constructed network. Transl. by M.J.S.

N75-15374 Academy of Sciences (USSR), Moscow.
STRUCTURE OF AN ADAPTIVE SYSTEM FOR MILLING OPTIMIZATION **c37**
Ya. G. Goldin, V. V. Dronov, Yu. A. Polyakov, and I. B. Rubashkin *In its* Probl. of Cybernetics 1974 p 231-234 ref In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

An asynchronous finite automation, the graph of its function, and the scheme of the systems results were investigated for lathes with digital programmed control. The graphs, schemes, and data tables for this automata are presented.
Transl. by M.J.S.

N75-15375 Academy of Sciences (USSR), Moscow.
STABILITY OF ONE TYPE OF ADAPTIVE SYSTEM OF MILLING MACHINE CONTROL **c37**
I. B. Rubashkin, Ya. G. Goldin, and A. N. Grin *In its* Probl. of Cybernetics 1974 p 235-239 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

An engineering method is presented for investigating the absolute stability of an adaptive control system which is needed for milling optimization according to maximum productivity criteria. Nonlinear channels and the Taylor formula are also discussed.
Transl. by M.J.S.

N75-15376# Academy of Sciences (USSR), Moscow.
ADAPTIVE CONTROL OF ACTIVE POWER CURRENTS IN ELECTRIC ENERGY NETWORKS **c33**
V. G. Davydov and R. P. Stroganov *In its* Probl. of Cybernetics 1974 p 240-243 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

It was shown that the algorithm for automatic control of active power currents in large energy plants should be built in the form of an adaptive algorithm which guarantees the high reliability of electrical transmission lines during maximum utilization of their permeability capacity. Algorithms are presented for dividing the network into transmitting and receiving parts for the most effective assemblies to the control in each of its parts. Transl. by M.J.S.

N75-15377 Academy of Sciences (USSR), Moscow.
USING INSTRUCTION ALGORITHMS FOR CONTROLLING ENERGY SUBSTANCES **c61**
V. I. Ageyev and V. G. Shlopak *In its* Probl. of Cybernetics 1974 p 244-247 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

Local-optimal instructing algorithms were constructed for recognition of energy system conditions on the basis of stochastic approximation and the pattern recognition theory. The quick and precise analysis of the condition for large boilers and turbines is discussed. Transl. by M.J.S.

N75-15378 Academy of Sciences (USSR), Moscow.
AN ADAPTIVE SYSTEM FOR OPTIMAL CONTROL OF

STATIC OBJECTS WITH LIMITATIONS ON THE OUTPUT COORDINATES AND ON CONTROL c37
D. P. Derevitskiy, N. F. Rubekin, V. I. Robin, and V. P. Shafranov *In its* Probl. of Cybernetics 1974 p 248-253 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

A system is described which includes an adaptive model, a block for selecting quasi-optimal controls, and an adaptive regulator for controlling disturbances. The adaptation algorithms were constructed on the basis of finite-convergence, and inequality-solving algorithms. Transl. by M.J.S.

N75-15379# Massachusetts Univ., Amherst. Dept. of Computer and Information Science.
CONTEXT IN WORD RECOGNITION
Allen R. Hanson, Edward M. Riseman, and Edward G. Fisher Aug. 1974 37 p refs Prepared in cooperation with Hampshire Coll., Amherst, Mass.
(Contract N00014-67-A-0230-0007)
(AD-786759; COINS-TR-74C-6) Avail: NTIS CSCL 09/2

Relatively low character error rates can often lead to prohibitive levels of word error rates. This paper is an examination of several techniques for integrating an independent contextual postprocessor (CPP) into a full classification system. The CPP detects errors and is the control structure for directing additional processing for correction of errors. (Modified author abstract) GRA

N75-15380# Arizona Univ., Tucson. Dept. of Mathematics.
FURTHER RESULTS ON SINGULAR PERTURBATIONS AND SINGULAR ARCS
Robert E. OMalley, Jr. and Antony Jameson Oct. 1974 8 p refs Prepared in cooperation with New York Univ., N. Y.
(Contract N00014-67-A-0209-0022; AT(11-1)-3077; NR Proj. 041-466)
(AD-786773; TR-7) Avail: NTIS CSCL 12/1

An asymptotic solution is obtained for the linear regulator problem with cheap control. The essential new element is the singular perturbation solution to the matrix Riccati equation. Author (GRA)

N75-15381# Naval Underwater Systems Center, New London, Conn.
OPERATING CHARACTERISTICS FOR DETECTION OF A FADING SIGNAL IN M ALTERNATIVE LOCATIONS WITH D-FOLD DIVERSITY
Albert H. Nuttall 20 Aug. 1974 69 p refs
(ZF61112001)
(AD-786371; NUSC-TR-4793) Avail: NTIS CSCL 09/4

The probabilities of correct decision and false alarm for a fading signal in M alternative locations with D-fold diversity are derived and numerically evaluated over the range of values M = 1, 2, 4, 16, 64, 256, 1024 and D = 1, 2, 3, 4, 6, 8, 12,16, 24, 32, 48, 64 for a wide range of signal-energy-to-noise-density-level ratios (ENR). These results which apply to the optimum receiver processor, have relevance to synchronization as well as to multiple alternative communication with thresholding. It is found that the optimum order of diversity does not correspond to the familiar 5 db ENR per branch, but rather to ENR branch values as large as 14 db for some cases of small false-alarm probability and moderate correct-decision probability. (Modified author abstract) GRA

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N75-15382 Polish Academy of Sciences, Warsaw.
BOLTZMANN RELATIVISTIC EQUATIONS WITH REGARD TO REAL PHYSICAL PROCESSES [RELATYWISTYCZNE ROWNANIE BOLTZMANNA Z UWZGLEDNIENIEM REALNYCH PROCESOW FIZYCZNYCH]
Stanislaw Kosowski 1973 34 p refs In POLISH
(Rept-27/1973) Avail: Issuing Activity

The relativistic Boltzmann equation was generalized for single-component gases with internal degrees of freedom, and for multicomponent gases with processes of particle creation and annihilation. Both classical and quantum degrees of freedom were characterized by one parameter, internal particle energy. Transl. by M.J.S.

N75-15383 Polish Academy of Sciences, Warsaw.
THE BOLTZMANN EQUATION IN KINETIC THEORY: A SURVEY OF MATHEMATICAL RESULTS
J. P. Guiraud 1973 53 p refs Presented at the 11th Symp. on Advanced Probl. and Methods in Fluid Mech., Kamienny Potok, 3-8 Sept. 1973
(Rept-31/1973) Avail: Issuing Activity

Various aspects of the kinetic theory of gases were investigated and mathematically analyzed. These include: the Cauchy problem, Boltzmann transport equation, boundary value problems, eigenvalues, forced sound waves, spectral problems, plane waves, and linear initial boundary value problems. M.J.S.

N75-15384*# Massachusetts Inst. of Tech., Cambridge. Electronic Systems Lab.
A CLASS OF FINITE DIMENSIONAL OPTIMAL NONLINEAR ESTIMATORS
Steven I. Marcus and Alan S. Willsky Sep. 1974 11 p refs
(Grants NGL-22-009-124; NSF GK-47090)
(NASA-CR-141279; ESL-P-569) Avail: NTIS HC $3.25 CSCL 12A

Finite dimensional optimal nonlinear state estimators are derived for bilinear systems evolving on nilpotent and solvable Lie groups. These results are extended to other classes of systems involving polynomial nonlinearities. The concepts of exact differentials and path-independent integrals are used to derive optimal finite dimensional estimators for a further class of nonlinear systems. Author

N75-15385# Aerospace Corp., El Segundo, Calif.
POSITION ESTIMATION FOR A SCAN SYSTEM VIA NONLINEAR FILTERING. PART 1: STATIONARY TARGET IN WHITE GAUSSIAN NOISE
K. K. Wong 1 Jul. 1974 44 p refs
(Contract F04701-74-C-0075)
(AD-785958; TR-0075(5901-03)-2-Pt-1; SAMSO-TR-74-219) Avail: NTIS CSCL 12/1

Bayes: estimation technique has been applied to the processing of the intensity data from the output of a scanning sensor. A simple recursive algorithm is realized for the position estimation of a stationary target. Author (GRA)

N75-15352 Academy of Sciences (USSR), Moscow.
THREE HEURISTIC SCHEMES FOR PRESENTING MULTIVARIABLE FUNCTIONS
A. N. Lapin *In its* Probl. of Cybernetics 1974 p 105-108 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

N75-15361 Academy of Sciences (USSR), Moscow.
SELF-INSTRUCTION ON THE DISCERNMENT OF SAMPLES ACCORDING TO A METHOD OF MIXED DISTRIBUTIONS
V. I. Vasilyev and V. V. Konovalenko *In its* Probl. of Cybernetics 1974 p 159-161 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

N75-15363 Academy of Sciences (USSR), Moscow.
TAXONOMIC CODING OF MULTICHANNEL SPECIMENS
A. N. Radchenko *In its* Probl. of Cybernetics 1974 p 168-171 In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

N75-15365 Academy of Sciences (USSR), Moscow.
SOLUTION TO THE PROBLEM OF OBSERVING AND IDENTIFYING DISTURBING EFFECTS BY AN INVERSE SENSITIVITY METHOD
R. M. Yusupov and Yu. Ya. Ostov *In its* Probl. of Cybernetics 1974 p 175-186 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N75-15386*# Massachusetts Inst. of Tech., Cambridge. Electronic Systems Lab.
ANALYSIS OF BILINEAR STOCHASTIC SYSTEMS
Alan S. Willsky, Steven I. Marcus, and David N. Martin Sep. 1974 9 p refs
(Grants NGL-22-009-124; NSF GK-42090)
(NASA-CR-141281; ESL-P-572) Avail: NTIS HC $3.25 CSCL 12A

Analysis of stochastic dynamical systems that involve multiplicative (bilinear) noise processes is considered. After defining the systems of interest, the evolution of the moments of such systems, the question of stochastic stability, and estimation for bilinear stochastic systems are discussed. Both exact and approximate methods of analysis are introduced, and, in particular, the uses of Lie-theoretic concepts and harmonic analysis are discussed. Author

N75-15387*# Rice Univ., Houston, Tex. Inst. for Computer Services and Applications.
RECURSIVE ESTIMATION OF PRIOR PROBABILITIES USING THE MIXTURE APPROACH
Demetrios Kazakos Sep. 1974 62 p refs
(Contract NAS9-12776)
(NASA-CR-141478; Rept-275-025-019) Avail: NTIS HC $4.25 CSCL 12A

The problem of estimating the prior probabilities q sub k of a mixture of known density functions f sub k(X), based on a sequence of N statistically independent observations is considered. It is shown that for very mild restrictions on f sub k(X), the maximum likelihood estimate of Q is asymptotically efficient. A recursive algorithm for estimating Q is proposed, analyzed, and optimized. For the M = 2 case, it is possible for the recursive algorithm to achieve the same performance with the maximum likelihood one. For M > 2, slightly inferior performance is the price for having a recursive algorithm. However, the loss is computable and tolerable. Author

N75-15388# RAND Corp., Santa Monica, Calif.
DELPHI ASSESSMENT: EXPERT OPINION, FORECASTING, AND GROUP PROCESS
H. Sackman Apr. 1974 125 p
(Contract F44620-73-C-0011)
(AD-786878; R-1283-PR) Avail: NTIS CSCL 12/1

A critical analysis of the delphi technique is presented in four parts. (1) The scope of the inquiry is defined, and issues pertinent to an evaluation of delphi are raised. (2) Conventional delphi is evaluated against established professional standards for opinion questionnaires, and against associated scientific standards for experimentation with human subjects. (3) Delphi is evaluated with respect to its assumptions, principles, and methodology. (4) Conclusions of the analysis are brought together and recommendations are made for future use of delphi. Author (GRA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

No abstracts in this category.

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N75-15389# Australian Post Office Research Labs., Melbourne.
ANALOGUE AND DIGITAL TIME-INVARIANT STEP-UP n-PORTS
A. J. Gibbs Jul. 1974 23 p refs
(Rept-6906) Avail: NTIS HC $3.25

A unified theory of analog and digital step-up n-ports was developed whereby complete step-up n-ports are shown to be represented by pure isometries on an appropriate Hilbert space. The structure of scalar valued Hardy spaces is then used to characterize analog and digital time-invariant complete step-up l-ports by methods much simpler than those previously reported. These results, together with the structure of vector valued Hardy spaces, are then used to derive sufficient conditions for the completeness of a large class of time-invariant step-up n-ports. Author

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N75-15390# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
A PRELIMINARY INVESTIGATION OF THE BEHAVIOR OF HIGH PURITY COPPER IN HIGH MAGNETIC FIELDS Annual Report
F. R. Fickett Aug. 1974 55 p refs Sponsored by Intern. Copper Res. Assoc.
(INCRA Proj. 186B)
Avail: NTIS HC $4.25

Results are presented on an experimental program to determine the properties of copper at low temperatures. The effect of iron as an impurity is considered at the part per million (ppm) level on the electrical and magnetic properties of copper at the temperature of liquid helium. At the other end of the temperature scale, possibility is examined for removing iron from molten copper by magnetic separation techniques. Author

N75-15391*# Linguistic Systems, Inc., Cambridge, Mass.
A STUDY OF THE VAN DER WAALS FORCE AT SMALL DISTANCES
F. Whitman, H. Splittgerber, and K. Ebert Washington NASA Apr. 1974 12 p refs Transl. into ENGLISH from Z. Phys. (Berlin), v. 245, 1971 p 354-360
(Contract NASw-2482)
(NASA-TT-F-15447) Avail: NTIS HC $3.25 CSCL 20K

The theory of Dzyaloshinskii allows us to calculate the Van der Waals force acting between two surfaces at a distance of 10,000 A and less from each other. This calculation was based on the experimentally determined absorption data of quartz. The deflection of a thin quartz plate which was supported at one end with a vaporized bar has been measured to verify the theoretical results. Within the range of accuracy a fair agreement could be reached. Author

N75-15392*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THEORY OF WAVES INCOHERENTLY SCATTERED
Pierre Bauer Dec. 1974 61 p refs Submitted for publication
(NASA-TM-X-70814; X-621-74-350) Avail: NTIS HC $4.25 CSCL 20N

Electromagnetic waves impinging upon a plasma at frequencies larger than the plasma frequency, suffer weak scattering. The scattering arises from the existence of electron density fluctuations. The received signal corresponds to a particular spatial Fourier component of the fluctuations, the wave vector of which is a function of the wavelength of the radiowave. Wavelengths short with respect to the Debye length of the medium relate to fluctuations due to non-interacting Maxwellian electrons, while larger wavelengths relate to fluctuations due to collective Coulomb interactions. In the latter case, the scattered signal exhibits a spectral distribution which is characteristic of the main properties of the electron and ion gases and, therefore, provides a powerful diagnosis of the state of the ionosphere. Author

N75-15393# Texas Univ., Austin. Dept. of Physics.
THE rf SUPPLEMENTED MAGNETIC MIRRORS Final Report
P. F. Little [1974] 147 p refs
(Contract AT(40-1)-4210)
(ORO-4210-1) Avail: NTIS HC $5.75

The reflection of single ions of approximately 5 eV energy in combined RF electric and static magnetic fields was observed. The RF E-field was predominantly transverse to the magnetic field, and the RF potential distribution on axis was determined experimentally. Computed values were found to agree with those measured on the axis, and thus the whole volume distribution of the RF potential was computed for the geometry in use. The experiments showed that transmission or nonadiabatic reflection occurred for all ions for certain ranges of parameters. Orbit calculations for many ions all agreed with observation except when the numerical method was known to be inaccurate. Adiabatic reflection was predicted to occur outside the range of the experimental parameters available. NSA

N75-15394# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EXPERIMENTAL STUDY OF CHARGING OF PARTICLES 0.2-4 MICROMETERS IN SIZE BY IONS OF AIR
L. M. Makalskii and G. Z. Mirzabekyan 11 Sep. 1974 21 p refs Transl. into ENGLISH from Silnye Elektricheskie Polya v Tekhnologicheskikh Protesessakh Elektronno-Ionnaya Tekhnologiya, Sbornik Statei (USSR), no: 2, 1971 p 95-108
(AD-786117; FTD-HC-23-1647-74) Avail: NTIS CSCL 07/4

Attempts, made to set up an experimental check of the law of charging particles 0.6 to 0.3 microns in diameter under conditions of production of charge close to the limiting ones, and at values of electric field strengths characteristic of the devices of electron-ion technology, are reported. Author (GRA)

N75-15395# Illinois Univ., Urbana. Dept. of Chemistry.
TIME DEPENDENT MAGNETIC PERTURBATIONS
H. S. Gutowsky Jun. 1974 48 p refs
(Contract N00014-67-A-0305-0023; NR Proj. 056-547)
(AD-786735; TR-5) Avail: NTIS CSCL 07/4

An introductory review is given of time dependent magnetic perturbations, with emphasis upon their utility in nuclear magnetic resonance experiments designed to determine the nature and rate of dynamic processes in solids and fluids. The types of magnetic perturbations considered include dipole-dipole interactions, chemical shifts, the scalar coupling of nuclei and magnetic field inhomogeneities. These perturbations can be made time dependent in a random manner by molecular reorientations and diffusion, conformational changes, and exchange of nuclei among different chemical species. Also, coherent time dependence can be generated by the application of rf magnetic fields at or near the Larmor frequency, by sample rotation in an inhomogeneous field, and by modulation of the main magnetic field. The phenomenological aspects of these cases are considered and the development of particular methods for studying chemical exchange is reviewed. The prospects for future research and applications in the field are assessed.
Author (GRA)

N75-15396# United Aircraft Corp., East Hartford, Conn.
MICROWAVE WAVEGUIDE MODULATORS FOR CO2 LASERS Semiannual Technical Report, 25 Mar. - 25 Sep. 1974
P. K. Cheo, M. Gilden, D. Fradin, and R. Wagner 25 Sep. 1974 37 p refs
(Contract N00014-73-C-0087)
(AD-787471; UARL-N92; SATR-4) Avail: NTIS CSCL 20/5

During this reporting period four significant advances have been made. The first two concern the structural quality of GaAs waveguides. The grating couplers which are an integral part of the waveguide structure are now being made by ion-beam milling technique instead of rf sputter-etching. This change of etching technique has provided remarkable improvement in the fabrication procedure. The second improvement involves the ruggedization of GaAs waveguide structure. The strength of a chemo-mechanically polished GaAs slab is very weak and has caused some difficulties during handling and processing cycles. The authors have developed a relatively strain-free metalization process by which thin layers of nickel-copper are deposited on the surfaces of GaAs slab. The metallic layer has provided a considerable strength to the GaAs waveguide structure. The next two significant accomplishments relate to the microwave aspects of the modulator development. One of the most significant result during this interm period is the experiment employing very high power to test the modulator. The result indicates that no failure is expected under a cw mode operation of this modulator at an input microwave power level in excess of 100 watts. GRA

N75-15373 Academy of Sciences (USSR), Moscow.
OPTIMIZATION OF THE TRAJECTORY OF AUTOMATIC DEVICE MOVEMENT
A. F. Yeremin and I. S. Zilitinkevich *In its* Probl. of Cybernetics 1974 p 227-230 refs In RUSSIAN (For availability see N75-15338 06-63)
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N75-15492 Joint Publications Research Service, Arlington, Va.
INVESTIGATING THE ACTIVITY OF AEROSOL OBTAINED IN BURNING A PbI,SUB2 PYROTECHNICAL COMPOSITION
N. Genadiev and P. Konstantinov *In its* Transl. of Eastern Europe, No. 445 (JPRS-63684) 17 Dec. 1974 p 1-11 refs Transl. into ENGLISH from Khidrol. Meteorol. (Sofia), no. 4, 1974 p 3-10 (For availability see N75-15491 06-81)

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution.*

N75-15397 Polish Academy of Sciences, Warsaw.
AUTOMATIC EXTRACTION OF BASIC TONE FREQUENCY AND OF THE FIRST THREE FORMANTS OF LANGUAGE SIGNAL [AUTOMATYCZNA EKSTRAKCJA CZESTOTLIWOSCI TONU PODSTAWOWEGO ORAZ PIERWSZYCH TRZECH FORMATOW SYGNALU MOWY]
Henryk Kubzdela 1973 153 p refs In POLISH
(Rept-51/1973) Avail: Issuing Activity

Models are presented of automatic extractors of language signal frequency parameters; the basic frequency extractor, and the frequency extractor of the first three speech formants. It was found that although the extractors are the same size and serve the same purpose, the problems connected with their use are different. Other topics discussed include amplitude detection, vertex discrimination, pitch extraction, and tabular presentations.
Transl. by M.J.S.

N75-15398 Central Electricity Generating Board, London (England).
SOUND RADIATION VIA THE CHIMNEY
H. C. Herbst Feb. 1973 13 p Transl. into ENGLISH from VGB Conf. on Power Stations and the Environment, (Essen), 27-28 Feb. 1973
(CE-Trans-6515; Paper-8) Avail: Issuing Activity

The noise pollution problem created by a power generating station is discussed. Noise recordings of the power station equipment showed that the two major sources of noise were: (1) the rotating piston blowers of the dust removing ducting and (2) the suction draft blowers. The design parameters of the equipment are defined. The contributions of the equipment to the noise problem were analyzed. The development, installation, and performance of noise damping equipment are reported. Diagrams of the power station are provided to show the geographical conditions and the acoustic levels at various distances from the plant. Author

N75-15399*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYSIS OF NOISE PRODUCED BY JET IMPINGEMENT NEAR THE TRAILING EDGE OF A FLAT AND A CURVED PLATE
Daniel J. McKinzie, Jr. and Robert J. Burns Washington Jan.

1975 32 p refs
(NASA-TM-X-3171; E-8080) Avail: NTIS HC $3.75 CSCL 20A

The sound fields produced by the interaction of a subsonic cold gas jet with the trailing edge of a large flat plate and a curved plate were analyzed. The analyses were performed to obtain a better understanding of the dominant noise source and the mechanism governing the peak sound-pressure-level frequencies of the broadband spectra. An analytical expression incorporating an available theory and experimental data predicts sound field data over an arc of approximately 105 deg measured from the upstream jet axis for the two independent sets of data. The dominant noise as detected on the impingement side of either plate results from the jet impact (eighth power of the velocity dependence) rather than a trailing-edge disturbance (fifth or sixth power of the velocity dependence). Also, the frequency of the peak SPL may be governed by a phenomenon which produces periodic formation and shedding of ring vortices from the nozzle lip. Author

N75-15400# Loughborough Univ. of Technology (England). Dept. of Transport Technology.
SIMPLE SOUND TRANSMISSION LOSS MEASUREMENTS USING A MODIFIED IMPEDANCE TUBE TECHNIQUE
A. R. Whatmore and M. V. Lowson 1973 15 p refs
(TT-73-R-02) Avail: NTIS HC $3.25

A method of comparing the sound transmission characteristics of various materials, and combinations of materials, is presented, using a modified impedance tube technique. The procedure is relatively quick and inexpensive compared with standard reverberation suite tests, and is therefore particularly useful for qualitative ranking of multiple samples. The limitations of the technique are discussed in some detail. Particular emphasis is given to the problems of small sample size and method of mounting in the apparatus. Author

N75-15401# SACLANT ASW Research Center, La Spezia (Italy).
ACOUSTIC RAY-TRACING AND PROPAGATION-LOSS COMPUTATIONS ON A MINI-COMPUTER
Martin Thompson and John B. W. Padley 1 Jul. 1974 22 p refs
(AD-786009; SACLANTCEN-SM-49) Avail: NTIS CSCL 20/1

Details are given of the derivation of formulae for the solution of the wave equations on a mini-computer, using a linear segment approximation to the sound-speed profile. A method is described for calculating the total propagation loss, and a brief description of the computer program used is given. Author (GRA)

N75-15402# SACLANT ASW Research Center, La Spezia (Italy).
AN EXPERIMENTAL STUDY OF THE REFLECTION OF UNDERWATER SOUND FROM THE SEA SURFACE
Willem Wijmans 15 Aug. 1974 59 p refs
(AD-786011; SACLANTCEN-SM-51) Avail: NTIS CSCL 20/1

An experimental study of forward scattering of sound from a rough sea surface has been made using an explosive charge as a broadband sound source and a linear array of omnidirectional hydrophones as a receiver. Using the surface-grazing angle of the incident sound and the sea-surface roughness as parameters the signal coherence has been examined for a single hydrophone (temporal coherence) and for the signals from two hydrophones of the array (spatial coherence). A simple theory has been used to guide the analysis. The surface scattering is assumed to consist of a coherent part and an additional incoherent part such that the total average received power is conserved. This time-frequency theory describes the surface-scattering process sufficiently well to agree with the experimental results.
Author (GRA)

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N75-15403 Association pour le Developpement des Tables de Constantes et Donnees Numeriques, Paris (France).
INTERNATIONAL CARD INDEX OF DIATOMIC MOLECULE ELECTRONIC SPECTRA Final Report [ETABLISSEMENT D'UN FICHIER INTERNATIONAL DE SPECTRES ELECTRONIQUES DES MOLECULES DIATOMIQUES]
G. Amat and S. Bourcier Dec. 1973 16 p In FRENCH
(Contract DGRST-73-7-1013)
Avail: Issuing Activity

Spectroscopic data on diatomic molecules, retrieved from literature, periodically updated, and controlled by an international board of specialists are stored in card index form for direct consultation and are published periodically. Examples are given. ESRO

N75-15404# Academy of Sciences of the Ukrainian SSR, Kiev (USSR). Inst. Teoreticheskoj Fiziki.
THEORY OF TWO-EXCITON LIGHT ABSORPTION IN COLLINEAR ANTIFERRODIELECTRICS
E. G. Petrov 1974 36 p refs
(ITF-74-9E) Avail: AEC Depository Libraries HC $5.00

The behavior of two-exciton absorption in antiferrodielectrics with antiparallel spins of the magnetic sublattices is studied systematically. A method of finding the effective dipole moment of the pair transition of interacting ions is given. The conditions are found under which the interaction between the optical excited ions is of Coulomb an exchange character. The general equations for Green's functions are obtained to express the coefficient of two-exciton light absorption. The experimentally observable light absorption in MnF2 in the frequency range of 2(E2),(E1),(E1) =(E2) transitions is explained on the basis of the theory developed.
Author

N75-15405# Academy of Sciences of the Ukrainian SSR, Kiev (USSR). Inst. Teoreticheskoj Fiziki.
IRREDUCIBLE REPRESENTATIONS OF THE SYMMETRY GROUP IN MANY ELECTRON PROBLEMS
M. F. Olekseeva and K. D. Tovstyuk 1974 13 p refs
(ITP-74-3E) Avail: AEC Depository Libraries HC $4.00

The use of correlation and Green functions to study irreducible representations of space time symmetry in many electron problems was examined. Author

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N75-15406# Laboratoire de Physique Theorique et Particules Elementaires, Orsay (France).
THE POMERON, VOLUME 2
J. TranThanhVan [1973] 605 p refs Proc. of the 8th Rencontre de Moriond, Meribel-les-Allues, France, 4-16 Mar. 1973 Sponsored by CNRS
Avail: NTIS HC $15.25

The proceedings of a conference on elementary particle reactions with emphasis on pomerons are presented. Some of the subjects considered include the following: (1) proton-proton elastic scattering, (2) high energy theorems for particle-particle and particle antiparticle scattering, (3) the importance of the structure of the pomeron, (4) elastic scattering of pi and K mesons on protons, (5) hadronic scattering at small and large momentum transfers, (6) impact parameter description of multiparticle and elastic scattering, (7) duality in reggeon-particle scattering, (8) pair production and quantum number exchange in multiparticle production, and (9) clusterings in hadronic production and Markovian walk. For individual titles, see N75-15407 through N75-15434.

N75-15407 Pisa Univ. (Italy). Istituto di Fisica.
TOTAL PROTON-PROTON CROSS-SECTION AT THE ISR
G. Bellettini *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 35-63 refs (For availability see N75-15406 06-73)

Data on total proton-proton cross section for center of mass

energy between approximately 23 and 53 GeV are reviewed. It was determined that the cross section grows by ten percent over the energy range indicated. A mathematical model is developed to show the total rate of interaction when two continuous beams cross each other at a specific angle. The procedures for conducting the following measurements are: (1) luminosity measurements and (2) rate measurement. Tables of data are provided to show the beam momentum, detected cross section, increment for elastic loss, and increment for inelastic loss. Author

N75-15408 European Organization for Nuclear Research, Geneva (Switzerland).
PROTON-PROTON ELASTIC SCATTERING AT ISR ENERGIES
P. Strolin *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 65-77 refs (For availability see N75-15406 06-73)

The experimental results obtained on proton-proton elastic scattering are reviewed. Emphasis is placed on the results obtained with large angle scattering. The test equipment used in the experiments is described and diagrams are provided. Graphs of the data obtained during the scattering experiments are developed and the significant aspects of the curves are explained. Author

N75-15409 National Accelerator Lab., Batavia, Ill.
SMALL ANGLE PROTON SCATTERING AT NAL AND AN EMERGING PICTURE OF HIGH ENERGY PROCESSES
R. A. Carrigan, Jr. *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 79-90 refs Sponsored by AEC (For availability see N75-15406 06-73)

Preliminary small angle proton-proton scattering results are reviewed. The data are related to other high-energy results on total cross sections, the forward real part, and moderate scattering. It is suggested that each effect undergoes a behavior transition in the energy range from 100 to 200 GeV. The techniques and equipment for conducting the experiments are explained. Graphs are provided to show the forward slope parameter in proton-proton elastic scattering and differential cross section for proton-proton elastic scattering. Author

N75-15410 European Organization for Nuclear Research, Geneva (Switzerland).
HIGH ENERGY THEOREMS FOR PARTICLE-PARTICLE AND PARTICLE-ANTIPARTICLE SCATTERING AND ISR DATA
Andre D. Martin *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 91-102 refs (For availability see N75-15406 06-73)

The asymptotic theorems which constrain the elastic scattering amplitude are discussed. The functions of positivity, analyticity, and unitarity are reviewed. This is done in the light of data on total cross sections for proton-proton scattering which show a rise with energy. Mathematical models are developed to show the results for differential cross sections. Curves are developed to show the total cross section compared with laboratory momentum. Author

N75-15411 European Organization for Nuclear Research, Geneva (Switzerland).
THE IMPORTANCE OF THE STRUCTURE OF THE POMERON
A. R. White *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 105-124 refs (For availability see N75-15406 06-73)

The derivation of the two-Pomeron cut discontinuity and decoupling results for Pomeron vertices from both the t-channel and the s-channel is discussed. It is emphasized that it is essential to consider the structure of the Pomeron in terms of its s-channel intermediate states, if consistency between the s- and t-channel results is to be achieved. Author

N75-15412 Washington Univ., Seattle. Dept. of Physics.
REGGEON THEORY OF DIFFRACTION SCATTERING
M. Baker *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 125-156 refs (For availability see N75-15406 06-73)

The theory of the Pomeron is reviewed and compared with proton-proton elastic scattering data. Mathematical models are developed to explain the scattering of two particles. A method for calculating the high energy limit of the scattering amplitude is described. Diagrams are included to show: (1) regge pole exchange contributions to scattering, (2) amplitude for two particles to decay into two Reggeons, and (3) amplitude for two Reggeons to produce two particles. Author

N75-15413 National Accelerator Lab., Batavia, Ill. Physics Dept.
THE IMPACT PICTURE FOR STRONG INTERACTIONS
J. K. Walker *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 159-192 (For availability see N75-15406 06-73)

A brief discussion of the general characteristics of the impact picture is given. This leads to a description of a phenomenological model of hadron scattering which on the one hand satisfies the impact picture at extremely high energies and on the other successfully describes the data above 20 GeV in the laboratory. In addition, many predictions on the general behavior of high energy hadron-hadron interactions are given. Author

N75-15414 Oxford Univ. (England). Dept. of Theoretical Physics.
SHADOW APPROACH TO DIFFRACTION SCATTERING
E. H. deGroot and H. I. Miettinen (Rutherford High Energy Lab.) *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 193-234 refs (For availability see N75-15406 06-73)

The use of s-channel unitarity in calculating high energy elastic scattering from multiparticle production amplitudes is discussed. The important role played by the phases of the production amplitudes for this problem is emphasized. As an illustration of the s-channel techniques, a simplified analysis of high energy elastic proton-proton scattering is performed. Author

N75-15415 Laboratoire de Physique Theorique et Particules Elementaires, Orsay (France).
EXPLORATORY DIP SYSTEMATICS IN ELASTIC SCATTERING
J. TranThanhVan *In its* The Pomeron, Vol. 2 [1973] p 235-246 refs (For availability see N75-15406 06-73)

The regularity in dip position of elastic differential cross sections at high energies is discussed. The dip structure for the elastic reactions of various charged particles are defined. The generation of mathematical relationships using the impact parameter representation is explained. It is stated that for a given reaction the dip position should move to larger (or smaller) value if the total cross section decreases (or increases) with the energy. Data of pion nucleon as well as antiproton-proton scattering show that such a dip moves toward the larger value. Author

N75-15416 Ecole Polytechnique, Paris (France).
ELASTIC SCATTERING OF PI PLUS AND K PLUS MESONS ON PROTONS AT 10 GeV
C. Baglin *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 247-265 refs (For availability see N75-15406 06-73)

The angular distributions of pi plus proton and K plus proton elastic scattering have been measured at an incident momentum of 10 GeV. Almost the entire angular range was covered in one experiment. Results from other experiments above 10 GeV are summarized. Some theoretical explanations are sketched for the observed forward peak structures and for the energy behavior of the large angle region. Author

N75-15417 Pittsburgh Univ., Pa.
PHENOMENOLOGY OF PROTON-PROTON SCATTERING AT ALL ANGLES
D. D. Coon and J. TranThanhVan (Lab. de Phys. Theorique et Particules Elementaires) *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 267-280 refs (For availability see N75-15406 06-73)

Fits have been made to the proton-proton differential cross section and the difference of the proton-antiproton and proton-proton total cross sections using a dual model of Baker and

Coon. These fits tend to indicate that: (1) there is a fairly simple dominant contribution to large momentum transfer processes, (2) the range of applicability of duality and Reggeism is much larger than one might expect, (3) the Baker-Coon model has an enormous range of quantitative validity, (4) the Pomeron contribution to the proton-proton differential cross section can be separated from the dual contribution and (5) the Pomeron contribution so extracted has a sharp diffraction minimum at the shoulder at t = minus 1.2 (GeV) squared. Author

N75-15418 Brown Univ., Providence, R.I. Dept. of Physics.
HADRONIC SCATTERING AT SMALL AND LARGE MOMENTUM TRANSFERS
H. M. Fried *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 281-288 refs Sponsored by AEC (For availability see N75-15406 06-73)
(COO-3130TA-279)

The nature of possible corrections to the Cheng-Wu forward-direction amplitude is examined on the basis of a complete eikonal formulation, which suggests strong cancellations away from the Froissart bound. Two models of wide-angle scattering, the interchange model and the hadronic bremsstrahlung model, are discussed and compared. Author

N75-15419 Wisconsin Univ., Madison. Dept. of Physics.
TRACING PARTONS IN HADRON COLLISIONS AT HIGH TRANSVERSE MOMENTUM
Francis Halzen *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 289-317 refs (For availability see N75-15406 06-73)

Hadron collisions at large transverse momentum are discussed. The subjects considered are: (1) the phenomenological analysis of two body reactions at large angles, (2) single particle inclusive reactions at large P sub T, and (3) jets of large transverse momentum hadrons. The form factor structure of field theory models for large angle scattering is explained. Author

N75-15420 Stanford Linear Accelerator Center, Calif.
DIFFRACTION PHENOMENA: REVIEW OF THE EXPERIMENTAL SITUATION
David W. G. S. Leith *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 319-382 refs (For availability see N75-15406 06-73)

In high energy particle physics diffraction is an important phenomena, accounting for approximately 30% of the total cross section, but it is not well understood. Diffraction is discussed in two terms: (1) a geometrical model in which the scattering of particles on an absorbing disc of a given size and with a given opacity (sometimes with edge effects taken into account); and (2) a t-channel dynamical picture where there is a particle exchange between the incident particle and the target particle (Regge theory and its modifications). The exchanged particle in the case of diffraction processes is called the Pomeron. Rules that allow the identification of what is meant by diffractive reaction or Pomeron exchange processes are described. Author

N75-15421 Commissariat a l'Energie Atomique, Saclay (France).
Q(+ OR -) PRODUCTION IN K(+ OR -)p INTERACTIONS AT 14 GeV/c
R. Barloutaud *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 383-399 refs (For availability see N75-15406 06-73)

Results on the production differential cross-sections of mesonic systems at 14.3 GeV/c are presented. The comparison to the mesonic system production differential cross-sections at the same incident momentum shows a definite cross-over. The relative amounts of C = -1 and I = 1 t-channel exchange amplitudes are found to be about equal in production and in elastic scattering at about the same incident momentum.
Author

N75-15422 Istituto Nazionale di Fisica Nucleare, Rome (Italy).
A2 PRODUCTION IN PION-PROTON COLLISIONS AND POMERON EXCHANGE
Gianni Conforto *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 401-409 refs (For availability see N75-15406 06-73)

The density matrix elements obtained in experiments studying the A2 production from pions via the decays of pions or kaons show that the energy dependence of the natural parity exchange component of the total cross-section is consistent with the 1/pion sub inc law and do not support the conclusion reached from the A2 yields proton pion data that some Pomeron exchange must be present in the production process. Author

N75-15423 Washington Univ., Seattle. Visual Techniques Lab.
A NEW MODEL OF DIFFRACTIVE DISSOCIATION
H. J. Lubatti and K. Moriyasu *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 411-433 refs (For availability see N75-15406 06-73)

A new model of diffractive dissociation is presented which explains most of the puzzling features of diffractive reactions. This model is based on an extension of the familiar Harari-Rosner dual quark diagrams. By introducing self-energy corrections to the bare hadron, new classes of dual diagrams are obtained. The new diagrams which are associated with diffractive dissociation provide simple intuitive explanations for many of the experimental features of diffractive reactions. In particular, the non-resonant behavior of the well-known diffractive enhancements is seen to be a direct consequence of the new diffractive diagrams. Author

N75-15424 Argonne National Lab., Ill.
REVIEW ON SCATTERING-AMPLITUDE ANALYSIS
A. Yokosawa *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 435-449 refs Sponsored by AEC (For availability see N75-15406 06-73)

Attempts to determine pion scattering amplitudes at around 6 GeV/c have been made since results of several scattering measurements with polarized-proton targets became available. New pion proton charge-exchange polarization data are discussed by comparing with various theoretical models and review pion amplitude analyses. Author

N75-15425 European Organization for Nuclear Research, Geneva (Switzerland).
SOME PROPERTIES OF ABSORPTIVE CORRECTIONS
A. D. Martin and P. Estabrooks *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 451-462 refs (For availability see N75-15406 06-73)

Absorptive corrections to Regge pole exchange are isolated in a non-flip pion proton reaction amplitude. The strength of absorption is found to decrease rapidly as the mass of the produced pion system increases. In particular, the Williams model, which has been found to give a good fit of the small t data in the proton region, is no longer satisfactory in the F region. Author

N75-15426 Michigan Univ., Ann Arbor. Randall Lab. of Physics.
IMPACT PARAMETER DESCRIPTION OF MULTIPARTICLE AND ELASTIC SCATTERING, WITH AN APPLICATION TO THE MULTIPERIPHERAL MODEL
Frank S. Henyey *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 463-490 refs Sponsored by AEC (For availability see N75-15406 06-73)

Impact parameter variables are defined for a multiparticle production process. The equation of unitarity for elastic scattering is written at high energy in terms of these variables. The overall impact parameter can be expressed in terms of the impact parameters of all produced particles. The unitarity equation becomes an optical theorem at each impact parameter (diffractive scattering is given by beam depletion). These features allow this technique to give a much clearer interpretation of unitarity in any model than has heretofore been possible. As an application of this technique, the multiperipheral model is examined. Short range order is shown to be equivalent to a random walk in impact parameter. Short range order, with an energy independent correlation length, is shown to be inconsistent with the combination of elastic and multiparticle data. Alternative models are suggested by use of this technique. Author

N75-15427 Brown Univ., Providence, R.I.
ON THE TWO-REGGEON CUT PROBLEMS
K. Kang *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 491-497 refs (For availability see N75-15406 06-73)

The two-Reggeon cut problem is reviewed in the light of recent developments concerning the notion of two-Reggeon irreducibility. Author

N75-15428 Rutherford High Energy Lab., Chilton (England).
DUALITY IN REGGEON-PARTICLE SCATTERING
D. P. Roy, P. Hoyer, and R. G. Roberts *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 499-514 refs (For availability see N75-15406 06-73)

The Dolen-Horn-Schmid type duality ansatz is extended to the Reggeon-particle amplitude, which is directly related to the inclusive cross-section in the resonance region M2 << s. The ansatz relates the resonance production cross-section dsigma/dt to the resonance mass M2J in terms of the exchanged trajectory alpha. These duality relations agree remarkably with a large number of resonance production data. Author

N75-15429 Helsinki Univ. (Finland).
A NOVA MODEL FOR DIFFRACTION DISSOCIATION WITH LONGITUDINALLY DECAYING NOVAS
K. Kajantie and P. V. Ruuskanen (Jyvaeskylae Univ.) *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 515-533 refs (For availability see N75-15406 06-73)

A model for diffractive events in high energy hadron collisions is constructed and the charged particle multiplicity distribution following from this is calculated. The model is a nova-type model in which the excitation spectrum of the nova behaves like M(-2) for large M and in which the nova decays longitudinally in its rest frame. These features are motivated by simple multiperipheral arguments. Implications of the results on multiperipheral and uncorrelated jet model descriptions of the pionization component are discussed. Author

N75-15430 Copenhagen Univ. (Denmark). Niels Bohr Inst.
A MODEL OF THE BREAKING OF HAGEDORN THEORY AND SCALING AT HIGH TRANSVERSE MOMENTUM
J. M. Dethlefsen, J. DiasdeDeus, and H. B. Nielsen *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 535-549 refs (For availability see N75-15406 06-73)

It is argued that the parton model suggests a deviation from the exact Hagedorn thermodynamic model. This in turn leads to a deviation for the large transverse momentum inclusive spectrum from the Planck spectrum expected from the Hagedorn theory. A model is taken in which fireballs are produced by collisions of partons in the beam and in the target. These fireballs then decay under successive emission of pions, say, with a decreasing temperature. Author

N75-15431 Laboratoire de Physique Theorique et Particules Elementaires, Orsay (France).
PAIR PRODUCTION AND QUANTUM NUMBER EXCHANGE IN MULTIPARTICLE PRODUCTION
Bengt Petersson *In its* The Pomeron, Vol. 2 [1973] p 553-562 refs (For availability see N75-15406 06-73)

An investigation is described of antiproton production. The analysis is extended to the production of Kaons. In both cases the rise with energy of the yield and the shape of the rapidity spectra, without free parameters, are explained. Author

N75-15432 Brown Univ., Providence, R.I.
CLUSTERINGS IN HADRONIC PRODUCTION AND MARKOVIAN WALK
Chung-I Tan *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 563-577 refs (For availability see N75-15406 06-73)

The approach to the scaling limit of the inclusive cross sections in the central region is correlated with the local clustering effect in the rapidity distribution. An explicit model is constructed where the scaling limit can be approached from below. This is then explained from the point of view of Markovian walk in one-dimension. Author

N75-15433 State Univ. of New York, Stony Brook. Inst. for Theoretical Physics.
PRODUCTION IN THE CENTRAL REGION
Jiunn-Ming Wang *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 579-582 refs (For availability see N75-15406 06-73)

Multiplicity distributions in a finite section of momentum space of the central region are discussed. Author

N75-15434 European Organization for Nuclear Research, Geneva (Switzerland).
A COMPARISON OF MEDIUM ENERGY DATA WITH ISR RESULTS
R. Stroynowski *In* Lab. de Phys. Theorique et Particules Elementaires The Pomeron, Vol. 2 [1973] p 583-605 refs (For availability see N75-15406 06-73)

The flow of important results from the Intersecting Storage Rings (ISR) at CERN has induced a change in terminology. What was called high energy during the past 10 years is now considered the medium energy range. It has become of the greatest interest to compare medium and high energy results. The specific experimental situation at the ISR makes it difficult to find lower energy data which may be directly compared. There is a tendency to discuss results from ISR separately from other data. Two areas are discussed which may be useful for future systematic studies of energy dependence of observed phenomena and some comparisons are presented of ISR data with the data coming from bubble chamber pion-proton experiments at 8, 16, and 23 GeV/c. Author

N75-15435# Oak Ridge National Lab., Tenn.
ORNL ISOTOPIC POWER FUELS Quarterly Report, period ending 31 Dec. 1971
Eugene Lamb and R. G. Donnelly Mar. 1972 38 p refs (Contract W-7405-eng-26)
(ORNL-4774) Avail: NTIS HC $3.75

The development of fuel forms-2(Cm-244)O3, (Pu-238)O2, 2(Cm-244)O3-for use at temperatures up to 2000 C and in aerospace, terrestrial, and marine environments, is reported. Physical and chemical properties of the compound and source form were determined as well as its compatibility with containment during the intended lifetime of the mission. Author

N75-15436*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ASYMPTOTIC FORM OF THE CHARGE EXCHANGE CROSS SECTION IN THE THREE BODY REARRANGEMENT COLLISIONS
K. Omidvar Jan. 1975 59 p refs Submitted for publication (NASA-TM-X-70807; X-602-74-359) Avail: NTIS HC $4.25 CSCL 20H

A three body general rearrangement collision is considered where the initial and final bound states are described by the hydrogen-like wave functions. Mathematical models are developed to establish the relationships of quantum number, the reduced mass, and the nuclear charge of the final state. It is shown that for the low lying levels, the reciprocal of n cubed scaling law at all incident energies is only approximately satisfied. The case of the symmetric collisions is considered and it is shown that for high n and high incident energy, E, the cross section behaves as the reciprocal of E cubed. Zeros and minima in the differential cross sections in the limit of high n for protons on atomic hydrogen and positrons on atomic hydrogen are given. Author

N75-15437# Electrotechnical Lab., Tokyo (Japan).
STUDIES ON NEUTRON THERMALIZATION AND THERMAL NEWTRON FIELD IN THE STANDARD GRAPHITE PILE
Taichi Michikawa Jul. 1974 106 p refs In JAPANESE; ENGLISH summary
(Rept-746) Avail: NTIS HC $5.25

Attempts were made to clarify exactly what produces the standard neutron field in a graphite phile by measuring the thermal neutron flux density and energy spectrum in the pile. The relationship between the space-time behavior of thermal neutrons and the phonon frequency distribution for graphite was made clear and the characteristics of the standard neutron field were investigated by measuring and analyzing the time dependent thermal neutron spectra with a pulsed neutron generator. Author

N75-15438*# Nebraska Univ., Lincoln. Behlen Lab. of Physics.
VIBRATIONAL STRUCTURE IN THE PHOTO-ELECTRON

SPECTRUM OF O2 +2 SIGMA(g)-(SIGMA g2s)
J. L. Gardner and James A. R. Samson [1974] 6 p refs Sponsored in part by NSF
(Grant NGR-28-004-021)
(NASA-CR-141960) Avail: NTIS HC $3.25 CSCL 20H

Discrete vibrational structure has been observed in the photo-electron spectrum of oxygen at an ionization potential of 40.33 eV. Two levels, attributed to the 02(+) 2 sigma g- final state, have been detected with a vibrational spacing of 0.071 eV. Author

N75-15439# Illinois Univ., Urbana. Physics Dept.
MULTIPLICITY DISTRIBUTIONS IN THE EIKONAL MODEL
Dale R. Snider and H. W. Wyld, Jr. Jan. 1975 35 p refs
(Grant NSF GP-40908X)
(ILL-(TH)-75-1) Avail: NTIS HC $3.75

A simple eikonal model, approximately consistent with geometric scaling, was developed and extended to predict the multiplicity distributions for high energy inelastic reactions. It was found that the naive form of the model does not fit the data, but that a simple modification, involving a subdivision of the available energy among the cut pomerons in the multipomeron exchange terms, does provide a reasonable fit to the data on multiplicity at 50, 69, 102, 205, 303, and 405 GeV/c. Author

N75-15440# Aerojet Nuclear Co., Idaho Falls, Idaho.
DYNAMIC GAMMA ATTENUATION DENSITY MEASUREMENTS
T. C. Piper May 1974 20 p refs
(Contract AT(10-1)-1375)
(ANCR-1160) Avail: NTIS HC $3.25

The considerations important in making density measurements, in small response time, by gamma attenuation measurement are enumerated and commented upon. A formula for the gamma source strength versus various parameters is obtained. Errors due to filtering, streaming, wall adherence, and detector peculiarities are discussed. Author (NSA)

N75-15441# Mound Lab., Miamisburg, Ohio.
PREPARATION OF UO2 AND Pu-238O2 FUEL PELLETS FOR A SMALL HEAT SOURCE
R. L. Deaton, C. J. Wiedenheft, and R. E. Zielinski 14 Jun. 1974 23 p ref
(Contract AT(33-1)-GEN-53)
(MLM-2123) Avail: NTIS HC $3.25

Pressed and sintered PuO2 fuel pellets were developed as an alternate fuel form for a small radioisotopic heat source. In initial development UO2 pellets were prepared prior to extending the study to (Pu-238)O2. As a result of this study, ideal pellet dimensions, shape, and pressing parameters were determined; 27 UO2 and 18 PuO2 pellets were fabricated. Author (NSA)

N75-15442# Japan Atomic Energy Research Inst., Tokyo.
INERT-ATMOSPHERE GLOVEBOX FOR HANDLING PLUTONIUM CARBIDE FUEL
S. Fukushima, T. Sasayama, Y. Suzuki, and H. Watanabe Mar. 1974 43 p refs In JAPANESE; ENGLISH summary
(JAERI-M-5599) Avail: AEC Depository Libraries

An inert atmosphere glovebox for handling uranium-plutonium mixed carbide fuel was designed and constructed. It consists of the stainless steel box with four pairs of glove ports and a vacuum airlock, an inert gas purifier, a gas circulation system, oxygen and water vapor measuring devices, an automatic pressure control system, and a safety alarm system. The apparatus is maintained at negative pressure to prevent the leakage of plutonium. Purity of argon gas depends on leakage of the glovebox and also performance of the purifier. A nickel catalyst bed and a molecular sieve bed are used to remove oxygen and moisture, respectively. The oxygen and water vapor concentrations in the inert atmosphere are held at 1 ppM at a circulation rate of 20 box-volumes/hr. The gas pressure in the glovebox is controlled at -30 + or - 20 mmAq during normal operation. Author (NSA)

N75-15443# Ballistic Research Labs., Aberdeen Proving Ground, Md.
PROTON PULSE RADIOLYSIS. 1: TECHNIQUES Final Report
Nathan Klein, Ronald A. Sasse, and Theodore J. Rock Aug. 1974 21 p refs
(DA Proj. 1T0-61102-B-11A)
(AD-785523; BRL-1735) Avail: NTIS CSCL 07/5

A requirement for the observation of short-lived, transient species in radiation chemistry is the availability of intense pulses of ionizing radiation. Beam control techniques for use with a pulsed, positive ion accelerator have been extended and when applied to the Army Tandem Van de Graaf accelerator, make available pulse repetition rates ranging from single pulse operation to 2 million pulses per second. In addition to radiation source development, techniques for the observation of emitted light at very low levels are also described. These techniques have been successfully employed to observe non-Cerenkov light emission from proton irradiated liquids. The techniques developed provide a powerful tool for the study of radiation phenomena involving species produced shortly after the energy transfer process. Author (GRA)

N75-15444# Naval Research Lab., Washington, D.C.
IRRADIATION EFFECTS ON REACTOR STRUCTURAL MATERIALS Semiannual Progress Report, 1 Feb. - 31 Jul. 1974
Lendell E. Steele Aug. 1974 72 p refs
(NRL Proj. M01-14; RR0221141)
(AD-786733; NRL-MR-2875) Avail: NTIS CSCL 18/10

The research program of the NRL Metallurgy Division, Reactor Materials Branch, involves a broad study of the effects of nuclear radiation upon materials. The report includes: (1) status and recent observations of AEC-CE-NRL cooperative program on improved (radiation resistant) A533-B steel plates and weldments; (2) strength and notch ductility of selected structural alloys after high fluence, 550F irradiation; (3) toughness of irradiated Type 316 weld metal using the J-Integral, (4) microstructure and swelling of EBR-II control rod thimble material; (5) the dose dependence of nickel ion damage in nickel; (6) studies of the mobility of helium in 316 stainless steel and aluminum, and (7) evaluation of tensile specimens from surveillance capsules of MH-1A reactor. (Modified author abstract) GRA

N75-15445# Naval Research Lab., Washington, D.C.
STRONG SUBMILLIMETER RADIATION FROM INTENSE RELATIVISTIC ELECTRON BEAMS
V. L. Granatstein, M. Herndon, R. K. Parker, and S. P. Schlesinger Aug. 1974 25 p refs
(NRL Proj. 77R08-53)
(AD-784996; NRL-MR-2855) Avail: NTIS CSCL 20/7

Radiation from an intense relativistic electron beam at submillimeter wavelengths has been measured with bandpass and high-pass filters. Radiated power about 100 kW has been measured in the passband 390 micrometers - 540 micrometers. The generation of this radiation depends on giving the electrons a large energy component transverse to the magnetic field. Coherent wave generation mechanisms which may account for the observed radiation are discussed. Author (GRA)

N75-15446# Lincoln Lab., Mass. Inst. of Tech., Lexington.
COMPUTER CODE USED IN MONTE CARLO CALCULATIONS OF THE ENERGY DISSIPATION IN A THIN POLYMER FILM BY ELECTRON BEAM SCATTERING
Andrew M. Hawryluk and Richard J. Hawryluk 13 Sep. 1974 36 p refs
(Contract F19628-73-C-0002)
(AD-786809; TN-1974-51; ESD-TR-74-283) Avail: NTIS CSCL 18/8

This note describes the computer program used in the Monte Carlo calculations of energy dissipation in a thin polymer film by electron beam scattering. The results of those calculations have been presented elsewhere. The purpose of the present work is to provide a short user's manual and a listing of the computer program. Author (GRA)

74 OPTICS

Includes light phenomena.

N75-15447*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ELIMINATION OF COHERENT NOISE IN A COHERENT LIGHT IMAGING SYSTEM
Gerald J. Grebowsky, Robert L. Hermann, Hugh B. Paull, and Arnold R. Shulman Mar. 1970 20 p Submitted for publication
(NASA-TM-X-70817; X-521-70-76) Avail: NTIS HC $3.25 CSCL 20F

Optical imaging systems using coherent light introduce objectionable noise into the output image plane. Dust and bubbles on and in lenses cause most of the noise in the output image. This noise usually appears as bull's-eye diffraction patterns in the image. By rotating the lens about the optical axis these diffraction patterns can be essentially eliminated. The technique does not destroy the spatial coherence of the light and permits spatial filtering of the input plane. Author

N75-15448# European Research Office, London (England).
INTERNATIONAL OPTICAL COMPUTING CONFERENCE
Philip H. Enslow, Jr. 1 Jun. 1974 33 p Conf. held at Zurich, 9-11 Apr. 1974
(AD-784625; ERO-07-74) Avail: NTIS CSCL 20/6

The conference program and organizational information is augmented by summaries of the meetings. Author (GRA)

N75-15449# Rochester Univ., N.Y. Inst. of Optics.
STUDIES IN OPTICS Technical Report, 13 Feb. 1970 - 15 Dec. 1973
Douglas C. Sinclair, Michael Hercher, and Brian J. Thompson Jun. 1974 64 p refs
(Contract F33615-70-C-1541; ARPA Order 0745)
(AD-786847; AFAL-TR-74-177) Avail: NTIS CSCL 20/6

The studies covered in this report are the design of optical frequency shifters for AC interferometry (Section II) and the production and assessment of corrector plates used to optically compensate for distortions in laser beams (Section III). Section II describes efforts to work out an electrooptical system for producing Doppler frequency shifts in laser beams. Section III describes the design, fabrication, and testing of a correction plate for removing distortions in a laser beam. (Modified author abstract) GRA

N75-15450# Army Electronics Command, Fort Belvoir, Va. Night Vision Lab.
PROXIMITY FOCUSED SECOND GENERATION IMAGE INTENSIFIERS
Herbert K. Pollehn 1973 16 p refs
(AD-785662) Avail: NTIS CSCL 20/6

A detailed analysis of the noise and image transfer characteristics of second generation proximity focused image intensifier tubes has been made. The analysis resulted in an understanding of sufficient depth of the physical and statistical processes in the tube, forming the basis for the development of the wafer intensifier to its current status and showed the way for the development of longer life and higher performance image intensifiers. GRA

N75-15451# Army Missile Command, Redstone Arsenal, Ala. Scientific and Engineering Systems Div.
A MODEL OF MASKING BY TERRAIN APPLIED TO VISUAL OBSERVATION
Mark R. Weldon Sep. 1974 54 p refs
(AD-786526; WS-75-1) Avail: NTIS CSCL 17/8

A simulation of masking by terrain, as applied to visual observation is described in detail. Basically the model generates the trajectory of a light ray from an observer to an observed point, examines the terrain at specified intervals along the trajectory, and determines if, and where, the light ray trajectory is masked by terrain. Author (GRA)

N75-15452# Utah Univ., Salt Lake City. Dept. of Chemistry.
BRILLOUIN SCATTERING OF LIGHT IN A CHOLESTERIC LIQUID CRYSTAL
C. H. Wang and Y. Y. Huang 17 Sep. 1974 13 p refs
(Contract N00014-67-A-0325-0007; NR Proj. 051-562)
(AD-785899; TR-8) Avail: NTIS CSCL 07/4

Brillouin scattering was used to study the hypersonic properties of cholesteryl palmitate in the liquid crystal-liquid phase transition region. Contrary to the results of similar measurements by Durand and Rao, no anomalous change in either the velocity or the attenuation of the hypersonic waves was observed at the transition. Author (GRA)

N75-15453# Virginia Univ., Charlottesville. Research Labs. for the Engineering Sciences.
THE APPLICATION OF IMAGE SENSING ARRAYS TO METROLOGY, DETECTION AND MAPPING Final Report
Eugene S. McVey, Edward A. Parrish, Jr., and Gerald Cook Jun. 1974 194 p refs
(Contract DAAK02-72-C-0090)
(AD-785727; EE-3317-107-74-U; ETL-CR-74-9) Avail: NTIS CSCL 08/2

This report covers the fourth year of a research effort devoted to the study of the application of image sensing arrays and related problems. Recent progress is reported in the areas of signal perturbation for edge detection and picture printing via LED's, optical data acquisition, use of Kalman filtering and smoothing for data resolution enhancement, and reseaux detection using spatial filtering techniques. It is intended that results of this effort will ultimately be applied to map processing and to other related areas. Author (GRA)

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N75-15454 Polish Academy of Sciences, Warsaw.
STOCHASTIC METHODS APPLIED IN DETERMINING THE TRANSPORT COEFFICIENTS IN PLASMA [METODY STOCHASTYCZNE W ZASTOSOWANIU DO WYZNACZANIA WSPOLCZYNNIKOW TRANSPORTU W PLAZMIE]
Krzysztof Zuchowski 1973 26 p refs In POLISH
(Rept-18/1973) Avail: Issuing Activity

A method was investigated for determining electrical conductivity, diffusion, and thermal conductivity of plasma. Other topics discussed include the Langevin equations, stochastic processes, the fluctuation-dissipation theory, friction coefficients, autocorrelation, and Fourier-Laplace transformations.
Transl. by M.J.S.

N75-15455*# Scientific Translation Service, Santa Barbara, Calif.
INJECTION OF A PLASMA CLOUD IN A TRANSVERSE MAGNETIC FIELD
S. Ye. Rosinskiy, V. G. Rukhlin, and M. A. Savchenko Washington NASA Jan. 1975 48 p refs Transl. into ENGLISH of "Inzhektsiya plazmennogo sgustka v poperechnom magnitnom pole", Pr-157, Acad. of Sci. USSR, Moscow, 1974 p 1-54
(Contract NASw-2483)
(NASA-TT-F-16110; Pr-157) Avail: NTIS HC $3.75 CSCL 20I

A qualitative description is given of the evolution of a dense plasma cloud, which is injected into the magnetosphere perpendicular to the magnetic field force lines. Characteristic times are evaluated for the free expansion and diffusion of the magnetic field into the cloud. Hydromagnetic instability questions are considered for the cloud surface. This instability is related to the surface curvature and the passage of the cloud around the magnetosphere plasma at the initial stage of magnetic field diffusion into the cloud. The effects of pressure anisotropy, which is caused by the passage of the cloud along the magnetic field force lines, are studied on the drift, and current instabilities are studied in the case of subsequent spreading of the cloud along the magnetic field. New instability modes are found which significantly affect the pressure anisotropy in an inhomogeneous plasma, or in the presence of a flux of particles in the plasma.
Author

N75-15456*# Bowling Green State Univ., Ohio. Dept. of Physics.
THE EFFECT OF SUPRATHERMAL PROTONS ON THE

PHYSICAL CONDITIONS IN SEYFERT GALAXY NUCLEI
Roger Ptak and Ronald Stoner [1974] 27 p refs
(Grant NsG-7022)
(NASA-CR-141307) Avail: NTIS HC $3.75 CSCL 20I

The physical conditions in a high density hydrogen gas heated and ionized by suprathermal protons were investigated, with application to the gas in the nuclear region of Seyfert galaxies. The gas is assumed optically thick to Lyman and Balmer line radiation. Mechanisms by which the radiation from the gas can balance the heating by the fast protons were investigated, and minimum values for the mass of gas were estimated. Under certain conditions, the suprathermal atoms themselves can cool the ambient gas by rescattering the line radiation into the optically thin region in the wings of the line. This mechanism, called optical reverberation, can enhance the broad component of the hydrogen lines produced by inelastic atomic collisions and yield line widths consistent with those observed in Seyfert and quasar spectra. Also discussed is the possibility of achieving dynamic equilibrium of the ambient gas by balancing the momentum transfer from the suprathermals with gravitational attraction of a massive central source. Author

N75-15457# City Univ., London (England). Dept. of Aeronautics.
INTERACTION OF A NEUTRAL GAS JET WITH A PLASMA STREAM
A. R. Martin and R. F. Barton 1974 61 p refs
Avail: NTIS HC $4.25 CSCL 20I

Attempts made to examine the interaction of a neutral gas plume with a plasma stream are reported. A Langmuir probe was used in conjunction with an x, y plotter to examine the change in ionization density at points in the plumes. Axial and radial traces were made at differing flow rates and graphs were plotted and compared. Analysis results show two types of plumes occured, blue and pink. Their occurence was found to be dependent on flow rate. An examination was also made of plume variation with increasing anode current. Author

N75-15458*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TIME-DEPENDENT OUTGASSING AND IMPURITIES IN THE NASA LEWIS BUMPY TORUS
Hans Persson 31 Oct. 1974 9 p refs Presented at 16th Ann. Meeting of the Plasma Phys. Div. of the Am. Phys. Soc., Albuquerque, New Mexico, 28-31 Oct. 1974
(NASA-TM-X-71639; E-8191) Avail: NTIS HC $3.25 CSCL 18A

To investigate the importance to fusion devices of desorption of gas from walls or cryosurfaces under long time operation, preliminary mass spectrometric investigations were carried out on the NASA Lewis Bumpy Torus with a 0.1-2A discharge in D2 at a pressure of 4.0 to 6.6 x 0.00001 torr. During the initial tens of minutes of discharge operation large quantities of a component with mass number 28, believed to be nitrogen, were released. The decrease with time of the nitrogen density after its initial maximum, indicated a diffusion controlled outgassing from cryodeposits or wall material. When cold surfaces were allowed to warm up, large quantities of gas were released. The integrated amount of N2 was typically the same as that released during a discharge, while the amount of H2O was orders of magnitude larger. Author

N75-15459# Nagoya Univ. (Japan). Inst. of Plasma Physics.
PROJECT JIPP T-2
Nov. 1974 37 p refs
(IPPJ-205) Avail: NTIS HC $3.75

The JIPP-T-2 device for investigating plasma transport and plasma heating in toroidal fusion reactors is described as a hybrid of a stellarator and a tokamak. It provides the helical field and the feedback control system of the vertical field. It was found that a toroidal plasma with a longitudinal current can be maintained in the equilibrium position beyond the skin time of the shell by controlling the vertical field during a discharge. Other topics discussed included scalings of plasma parameters, stability considerations, impurity problems, neutral beam injection heating, and resonant frequency heating. M.J.S.

N75-15460# Princeton Univ., N.J.
TWO-ENERGY-COMPONENT FUSION REACTORS WITH SUSTAINED SUPRATHERMAL-ION ENERGY Plasma Physics Lab.
D. L. Jassby and H. P. Furth May 1974 19 p refs
(Contract AT(11-1)-3073)
(MATT-1048) Avail: NTIS HC $3.25

The energy multiplication factor of the D-T two-energy-component reactor scheme can be enhanced by a factor of about two if the suprathermal ion energy is clamped at the value that gives maximal ratio of fusion reaction rate to plasma drag. The optimal energy is in the range 105 to 145 keV, significantly lower than the optimal energy in the conventional scheme. To realize the maximum gain, the clamping period must be many times the slowing-down time, or else the suprathermal energy must be recovered (e.g., by magnetic decompression at the end of the clamping period). In a tokamak device there are several possible techniques for accomplishing energy clamping; the most promising is slow major-radius compression.
Author (NSA)

N75-15461# Illinois Univ., Urbana. Gaseous Electronics Lab.
POTENTIAL WELL FORMATION IN ELECTROSTATIC CONFINEMENT DEVICES Technical Progress Report
B. E. Cherrington and J. T. Verdeyen 1974 60 p refs
(Contract AT(11-1)-2323)
(COO-2323-3) Avail: NTIS HC $4.25

This program is to evaluate the feasibility of using inertial electrostatic forces to confine energetic plasmas capable of sustaining fusion reactions. It was shown experimentally that electron injection into a spherical system under high vacuum conditions produces a deep negative potential well. The recent theoretical analysis of this system gives excellent agreement with the experimental results. Of much more importance is the observation of a stable multiple potential well structure (ion rich region in the center) when electrons are injected into a low pressure deuterium gas background. The extension of the theoretical analysis to explain these results do give qualitative agreement with the experimental results. Author (NSA)

N75-15462# California Univ., Livermore. Lawrence Livermore Lab.
DART: A SIMULATION CODE FOR A DIRECT ENERGY CONVERTER FOR FUSION REACTORS
B. C. Howard, W. L. Barr, and R. W. Moir 13 May 1974 93 p refs
(Contract W-7405-eng-48)
(UCRL-51557) Avail: NTIS HC $4.75

The DART code simulates the behavior of the charged particles which leak out of a mirror fusion reactor and are electrically recovered in a direct energy converter. The code was used to design a laboratory-scale direct energy converter. A full-scale reactor converter is now being designed. The simulation technique, which includes space charge and secondary particle effects, and the method for calculating the efficiency with which the ion energy is converted to electricity is described. Output examples and listings of DART and several directly related codes are given. Author (NSA)

N75-15463# Illinois Univ., Urbana. Charged Particle Lab.
PROGRAM TO DEVELOP THE TECHNIQUES OF GENERATION AND CONTROL OF CRYOGENIC MATERIAL PARTICLES FOR USE ON FUSION SYSTEMS Progress Report, 1 Jun. 1972 - 31 May 1973
Charles D. Hendricks 31 May 1973 7 p
(Contract AT(11-1)-2234)
(COO-2234-1) Avail: NTIS HC $3.25

A method was developed for producing macroscopic deuterium particles to be injected into plasma machines such as TOKOMAKS. The purpose of the injection is for refueling and for diagnostics. In the particle generator, deuterium or hydrogen gas is liquified by cooling the gas by cold helium gas or liquid helium. The liquid hydrogen is formed into a liquid jet and caused to break up into uniform drops. The drops, when injected into a vacuum, freeze by evaporative cooling and become solid particles (spheres). An electric charge can then be put on the spheres and makes possible the attainment of high velocities by electrostatic acceleration. While particles may be produced

with radii in the range of five to several hundred micrometers, current efforts involve production of particles with radii in the few tens of micrometers. Author (NSA)

N75-15464# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
REGIME WITH CATHODE STREAM IN PLASMA SOURCE WITH EXTERNAL MAGNETIC FIELD
A. M. Bishaev and A. I. Bugrova 3 Oct. 1974 11 p refs Transl. into ENGLISH from Plazmenmye Uskoriteli (USSR), 1973 p 147-150
(FTD Proj. T74-04-03)
(AD-786902; FTD-HT-23-1067-74) Avail: NTIS CSCL 20/9

Results of experimental studies on axisymmetrical plasma sources with an external magnetic field are examined. Two sources were examined; each source consisted of a central cathode and a cylindrical or annular anode bearing a magnetic coil. Author (GRA)

N75-15465# Naval Research Lab., Washington, D.C.
PARALLEL CONCEPTS IN THE DERIVATION OF THE CLASSICAL AND QUANTUM BOLTZMANN EQUATIONS
Ira B. Bernstein and David L. Book Jul. 1974 27 p refs
(NRL Proj. 77H02-37)
(AD-784992; NRL-MR-2838) Avail: NTIS CSCL 07/4

The kinetic equation describing a spacially inhomogeneous dilute gas is derived from the appropriate hierarchy equations according to both classical and quantum mechanics. In the former case one obtains the Boltzmann equation, in the latter the Uehling-Uhlenbeck equation. The derivations in the two cases are completely parallel and assume only that two-particle correlation functions factor into products of one-particle functions when the two particles are separated by distances greater than the range lambda of the interaction potential, and that terms of order n(lambda cubed) --1, where n is the particle density, may be dropped compared with terms of order unity in equations of motion. Author (GRA)

N75-15466# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INSTABILITY AND ANOMALOUS DIFFUSION IN HALL NONEQUILIBRIUM PLASMA SOURCE
V. I. Arefyev and B. S. Borisov 3 Oct. 1973 9 p refs Transl. into ENGLISH from the book "Plazmennyye Uskoriteli" USSR, 1973 p 142-144
(FTD Proj. T74-04-03)
(AD-787349; FTD-HT-23-1065-74) Avail: NTIS CSCL 20/9

In experiments in which the energy balance in a nonequilibrium plasma source was studied an unusally great diffusion of plasma across the magnetic field was observed. Here it was pointed out that the rapid drift of particles to the walls could not be explained by Coulomb collisions alone. In the present study it is proposed that this phenomenon is caused by the oscillations which develop as a result of current-dissipative instability. GRA

N75-15467# Air Force Weapons Lab., Kirtland AFB, N.Mex.
THE TWO-DIMENSIONAL HYDRODYNAMICAL SIMULATION OF AN ELECTROMAGNETIC IMPLOSION DEVICE Technical Report, Jul. 1972 - Feb. 1973
Clifford E. Rhoades, Jr. and Keith A. Taggart Mar. 1974 131 p refs
(AF Proj. 8809)
(AD-786885; AFWL-TR-73-267) Avail: NTIS CSCL 20/9

The electromagnetic implosion device which is geometrically a Z-pinch is simulated by a two-dimensional Lagrangian hydrodynamical computer code. The usual Lagrangian differencing scheme problem of mesh distortion is overcome by a coordinate orthogonalization scheme. This report described in detail the physics as well as the numerical techniques of the simulation. It is also intended as a user's manual for the computer code. Author (GRA)

N75-15468# Minnesota Univ., Minneapolis. Dept. of Electrical Engineering.
STUDY OF PLASMA SHEATHS Final Report, 1 Feb. 1973 - 31 Mar. 1974
Hendrik J. Oskam and Ramanuj Sharan Apr. 1974 131 p refs
(Contract F19628-73-C-0128; AF Proj. 8659)
(AD-786451; AFCRL-TR-74-0221) Avail: NTIS CSCL 10/2

A theoretical model of a thermionic gas diode with ion injection through the anode was developed. Charged particle currents due to the electric field as well as due to charged particle density gradients were incorporated in the model. This made it possible to study the effect of ion injection on the magnitude and location of the potential barrier in front of the hot cathode. The model was solved numerically for various experimental conditions. The results obtained explained the previously observed large space charge neutralization efficiencies of the injected ions. Author (GRA)

N75-15469# Harry Diamond Labs., Washington, D.C.
SIMULATION OF A SIMPLE LORENTZ PLASMA WITH A RANDOM DISTRIBUTION OF INDUCTIVELY-LOADED DIPOLES
John F. W. Dietz and George Merkel 1973 16 p refs
(AD-785618) Avail: NTIS CSCL 20/9

The complete simulation of the electromagnetic pulse, EMP, associated with a nuclear burst involves a number of interrelated parameters. The most obvious parameters are the waveform and the magnitude of EMP. However, if the system being subjected to the nuclear EMP is in a preionized region such as the ionosphere, it would also be necessary to simulate the ionization or dielectric constant of the medium surrounding the system such as a missile or satellite. In this work the authors investigate the feasibility of using an artificial dielectric consisting of a random distribution of inductively-loaded short dipoles to simulate the macroscopic electromagnetic properties of a simple Lorentz plasma. GRA

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N75-15470 Polish Academy of Sciences, Warsaw.
INFLUENCE OF MOLECULAR ORIENTATION ON THE CRYSTALLIZATION OF ETHYLENE POLYTEREPHTHALANE [WPLYW ORIENTACJI MOLEKULARNEJ NA KRYSTALIZACJF POLITEREFTALANU ETYLENOWEGO]
Andrzey Wasiak 1973 109 p refs In POLISH
(Rept-39/1973) Avail: Issuing Activity

The deformation and orientation of polymer macroparticles in amorphous regions and the resulting influence on structure formation during phase transformations were investigated. X-ray diffraction, density measurements, optical double refraction, average light fracture coefficients, and light dispersion samples were used to investigate isothermal crystallization of uniaxially-oriented samples of amorphous ethylene polyterephthalane. It was found that introductory molecular deformation influences the character of the crystal structure and the crystallization velocity. Transl. by M.J.S.

N75-15471 Laboratoire Central de Recherches Thomson-CSF, Orsay (France).
LIQUID CRYSTAL PHYSICAL PROPERTIES FOR VISUAL DISPLAYS Final Report [ETUDE DES PROPRIETES PHYSIQUES DES CRISTAUX LIQUIDES EN VUE DE LA VISUALISATION]
M. Hareng Jul. 1973 85 p refs In FRENCH
(Contract DGRST-72-7-0011)
(LCR-73-151/R/G.5) Avail: Issuing Activity

Liquid crystals and their use as visual displays are discussed. Special attention was given to the dynamic diffusion of nematics in relation to spatial homogeneity in view of large cell production and multiplex displays. The main parameters involved are the absorption capabilities at electrode level and boundary conditions related to the rest structure. Data are also given on the chemical nature and increased lifetime of the crystals. For color displays applications a comparative study was made between dichoric molecules, cholesteric mixtures, and birefringence. The birefringence technique was selected and discussed with regard to: (1) hometopic structure of negative dielectric anistropy crystals,

(2) structure production, (3) problems related to electric field production, (4) parametric measurement emphasizing the relationship between applied electric field and optical phase shift, (5) temperature effects, (6) nematic film thickness, and (7) stabilizing magnetic field. ESRO

N75-15472 Paris Univ. (France). Lab. de Physique des Solides.
NUCLEAR MAGNETIC RESONANCE STUDY OF METAL-INSULATOR TRANSITION IN RUTILE STRUCTURE COMPOUNDS Final Report [ETUDE DE LA TRANSITION METAL-ISOLANT DANS LES COMPOSES A STRUCTURE RUTILE]
H. Launois and C. Froidevaux Dec. 1973 11 p refs In FRENCH; ENGLISH summary
(Contract DGRST-71-7-2779)
Avail: Issuing Activity

Nuclear magnetic resonance was used to investigate the metal-insulator transition in VO2 and its alloys. Electron correlations are important in the high temperature rutile phase. In pure VO2 they produce a high spin susceptibility due to d electrons, while in V(1-x)Nb(x)O2 alloys conduction electrons are localized by disorder and correlation effects. The highly correlated nature of the low temperature monoclinic phase appears in the insulating phases of V(1-x) Cr(x)O2 alloys in which Heisenberg chains are observed. ESRO

N75-15473 Ecole Normale Superieure, Paris (France). Lab. de Physique.
OPTICAL, MAGNETO-OPTICAL AND ELECTRO-OPTICAL PROPERTIES OF SELENIUM Final Report [ETUDES DES PROPRIETES OPTIQUES, MAGNETOOPTIQUES ET ELECTROOPTIQUES DU SELENIUM]
J. P. Vieren, Nguyen HyHau, and C. Rigaux Jan. 1974 22 p refs In FRENCH
(Contract DGRST-71-7-2957-PE)
Avail: Issuing Activity

Optical transitions of selenium crystals in the gap region (1.5 to 3eV) were studied; absorption, electroabsorption, reflectivity, and luminescence were determined by modulation spectroscopic techniques. Results indicate the existence of an indirect and a direct gap. Spectra between 1.85 and 1.9 eV were interpreted as representing excitonic transitions with phonon emission. Polarization and peak energy values confirm theoretical previsions. Preliminary experiments in nonlinear optics indicate the interest of selenium in this domain. ESRO

N75-15474 Centre National de la Recherche Scientifique, Meudon (France). Lab. de Physique des Solides.
STUDY OF NATIVE DEFECTS AND NATURAL IMPURITIES OF THE EQUILIBRIUM IN ZINC TELLURIDE Final Report [ETUDE DES DEFAUTS NATIFS ET DES IMPURETES A L'EQUILIBRE DANS LE TELLURURE DE ZINC]
H. Rodot Oct. 1973 105 p refs In FRENCH
(Contract DGRST-72-7-0089)
Avail: Issuing Activity

Effects of native defects (Te excess or Zn vacancies) and of Cu, Ag, Li, Na, B, Al, P, and O equilibrium doping on the characteristics of ZnTe were investigated. Impurity concentration, charge transfer and ionization energetics, and the nature and energy of transitions were determined by analytical methods (mass spectrography, ionic sounding, and activation analysis). Hall effect and resistivity measurements, and photoluminescence and cathodeluminescence spectra, respectively. Experimental apparatus developed during the study is described. ESRO

N75-15475 Commissariat a l'Energie Atomique, Grenoble (France). Div. Cristallogenese et Recherche sur les Materiaux.
GROWTH OF ALCALINE HALOGENATES Final Report [CROISSANCE EN SOLUTION D'HALOGENATES ALCALINS COMPTE RENDU DE FIN DE CONTRAT]
J. Daval, H. Vial, and M. Couchaud Jan. 1973 19 p In FRENCH
(Contract DGRST-71-7-2658)
Avail: Issuing Activity

Halogenates of alkaline metals and thallium were synthesized and uniaxial monocrystals were grown from aqueous solutions. Monocrystals from LiIO3, KiO3, TlClO3, TlBrO3, and KBrO3 were selected and tested for their electro-optical and acoustic-optical properties (frequency doubling). ESRO

N75-15476*# Alabama Univ., University.
ELLIPSOMETRIC MEASUREMENTS OF EPITAXIAL GaAs LAYERS ON A GaAs SUBSTRATE Final Report
Donald J. DeSmet 17 Dec. 1974 9 p refs
(Contract NAS8-29494)
(NASA-CR-120574) Avail: NTIS HC $3.25 CSCL 20L

An extensive examination of ellipsometric equations for anisotropic surfaces and films is reported. It is shown that the reflection matrix can be calculated by writing Maxwell's equations in 6 x 6 matrix form and by applying appropriate boundary conditions at proper points in the development of the formalism, reducing the equation for the propagation of light to an eigenvalue problem using a 4 x 4 matrix. G.G.

N75-15477# Picatinny Arsenal, Dover, N.J. Feltman Research Labs.
CORRELATION OF THE VIBRATIONS OF MOLECULES AND STABILITY IN ENERGETIC MATERIALS
Henry J. Prask, Chang S. Choi, Zafar Iqbal, and Samuel F. Trevino 1974 16 p refs
(AD-785663) Avail: NTIS CSCL 20/12

The paper represents implementation and refinement of the capabilities required to characterize fundamental processes in energetic materials. In particular, attention is focused on the correlation of interatomic forces and physical and chemical instability as manifested by changes in the dynamics of molecular groups in ammonium nitrate, ammonium perchlorate and the metal-azide salts. Results for the compounds are preceded by a discussion of experimental techniques including that of quasi-elastic neutron scattering which has not previously been employed for energetic materials. A brief introduction to the theory of lattice or molecular dynamics is also presented. GRA

N75-15478# Illinois Univ., Urbana. Coordinated Science Lab.
DIRECT IDENTIFICATION OF ATOMIC BINDING SITES ON A CRYSTAL
William R. Graham and Gert Ehrlich Jul. 1974 53 p refs
(Contract DAAB07-72-C-0259; Grant AF-AFOSR-2210-72)
(AD-786541; R-656; UILU-ENG-74-2222) Avail: NTIS CSCL 07/4

The atomic resolution of the field ion microscope, in conjunction with its ability to remove and identify individual atomic layers, has been used to map unambiguously the unit cell of the (111) plane of tungsten and to determine directly the location of single tungsten atoms absorbed on this plane. Adatoms have been observed to occupy two binding sites only. The predominant site corresponds to a normal lattice position. The second site is of similar symmetry, in that the adatom sits between three first layer atoms; however, at this position the adatom is located above an atom in the second rather than the third lattice layer. The former site is favored energetically, but only by approximately 1/2 eV. All observations have been made at high fields, but it is shown from studies of migration and other effects that the binding sites identified in the field ion microscope are typical of a normal, field free environment. Author (GRA)

N75-15479# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
GENERAL TRANSIENT SOLUTION METHOD FOR THE ENTIRE SUDDEN DEFORMATION DOMAIN OF TWO-DIMENSIONAL SOLIDS Interim Rept.
Moche Ziv Mar. 1974 151 p refs
(Grant AF-AFOSR-2330-72; AF Proj. 6813; AF Proj. 9782)
(AD-786043; TAE-204; AFOSR-74-1502TR) Avail: NTIS CSCL 20/11

New avenues of approach are presented for the overwhelming task of ascertaining the multi-dimensional transient deformation of solids. Waves emanate from impulsive sources and their reflections from boundaries map a strong discontinuity region into the solid. The region is comprised of longitudinal, shear, and head waves, all of which are revealed in the solution by the new method. Two main programs constitute the method: an analytical formulation which is the dominating base, and a numerical integration technique. The analytical part is a kinematical approach, therefore valid for any field equations. It consists of

superimposing compatible kinematical relations, existing across strong discontinuity surfaces, on the multi-dimensional theory of characteristics. The dynamical part is constructed of a wave grid and the integration along these paths is carried out numerically via the finite-difference technique. (Modified author abstract)
GRA

N75-15480# Air Force Weapons Lab., Kirtland AFB, N.Mex.
NUMERICAL SOLUTIONS OF THE THREE-DIMENSIONAL KINETIC EQUATION OF THE PARAMETRIC DECAY INSTABILITY Final Report, Jan. 1973 - Jan. 1974
J. D. Letterio and B. B. Godfrey Jul. 1974 136 p refs
(AF Proj. 8809)
(AD-787455; AFWL-TR-74-146) Avail: NTIS CSCL 20/9

The three-dimensional time dependent kinetic equation for the saturation of the weakly driven parametric decay instability is solved numerically. Two cases are considered: (1) nonlinear Landau damping only and (2) nonlinear Landau damping plus mode-coupling. For both, relative pump powers range from 1 to 20. In general, the mode-coupling terms act to enhance saturation energy somewhat at large angles, without significantly affecting the total saturation energy level or the time evolution prior to saturation. For a deuterium plasma, the anomalous resistivity rate (relative to the plasma collision frequency) is found to be approximately 3.2 P sup(1.35), with P the relative pump power. Author (GRA)

N75-15481# California Univ., Los Angeles. Plasma Physics Group.
EFFECT OF LOCALIZED ELECTRIC FIELDS ON THE EVOLUTION OF THE VELOCITY DISTRIBUTION FUNCTION
G. J. Morales and Y. C. Lee Sep. 1974 20 p refs
(Contract N00014-69-A-0200-4023)
(AD-787034; PPG-190) Avail: NTIS CSCL 20/9

The interaction between charged particles and sharply localized fields is investigated. The random particle scattering is described by a Fokker-Planck equation whose time dependent solution exhibits the formation of a highly populated superthermal tail. Author (GRA)

N75-15482# California Univ., Irvine. Dept. of Physics.
THEORY OF PSEUDOSURFACE POLARITONS IN SEMICONDUCTORS IN MAGNETIC FIELDS Final Report
J. J. Brion and R. F. Wallis Jun. 1974 14 p refs
(Contract N00014-69-A-0200-9003; NR Proj. 015-731)
(AD-785870; TR-74-7) Avail: NTIS CSCL 20/12

A theoretical discussion is presented of pseudosurface polaritons associated with magnetoplasmons in a semi-infinite sample of a semiconductor. The dispersion curve, electric field ratios and attenuation constants connect smoothly to the corresponding quantities outside of the pseudosurface wave region. The geometrical configuration of magnetic field perpendicular to the surface and arbitrary wave vector direction is discussed. A comparison is made of the dispersion relation of pseudosurface polaritons with that of surface polaritons outside of the pseudosurface wave region. Author (GRA)

N75-15483# Harry Diamond Labs., Washington, D.C.
LARGE POLARIZATION DEPENDENT VOLTAGES IN FERROELECTRIC CERAMICS
Philip S. Brody and Frank Crowne 1973 12 p refs
(AD-785608) Avail: NTIS CSCL 20/12

This paper describes a new high-voltage photovoltaic effect appearing in ferroelectric ceramics. A thin ceramic wafer illuminated uniformly produces a steady voltage across electrodes on the wafer edge. This is a new effect with possible applications. This effect could be used to produce very high voltages in a relatively uncomplicated fashion. Of greater importance, perhaps, is a possible potential for direct solar-to-electric energy conversion, although this would necessitate finding a material with considerably greater photovoltaic efficiencies over broader spectral regions. GRA

N75-15484# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NATURE OF SECONDARY RADIATION DEFECTS IN SILICON OF THE P-TYPE
V. S. Vavilov, B. N. Mukeshev, and A. V. Spitsyn 20 Sep. 1974 7 p refs Transl. into ENGLISH from Vysokomolekul. Soedin., Ser. b. Kratkie Soobshcheniya (Moscow), no. 8, Aug. 1972 p 38-41
(AD-786914; FTD-HC-23-2305-74) Avail: NTIS CSCL 20/12

Samples of p-type silicon alloyed with boron, aluminum, or gallium, were irradiated at 78K with electrons having an energy of 1.5 MeV, and then subjected to isochronous annealing in the temperature range of 78 -- 700K. Information on annealing and the conditions of radiation defects were obtained from an analysis of the data on the carrier concentration, which in turn was determined by measuring the Hall effect and the electric conductivity. GRA

N75-15485# Army Foreign Science and Technology Center, Charlottesville, Va.
LEAD TELLURIDE ALLOYED WITH INDIUM AND LANTHANUM
V. V. Gorbachev, V. A. Linsky, E. F. Makarov, E. A. Zhemchuzhina, and A. I. Ivanov 13 May 1974 16 p refs Transl. into ENGLISH from the book "Khimich. Svyaz v Poluprovod. i Polumetallakh" Minsk, 1972 p 374-382
(AD-786794; FSTC-HT-23-728-74) Avail: NTIS CSCL 20/12

Data are presented and discussed on the behavior of lead telluride alloyed with indium and with lanthanum. The data include Hall coefficient, conductance, thermal emf, Hall mobility, microhardness and bending strength. The possibility is demonstrated of determining the mechanisms of behavior of the alloying impurities in lead telluride by measurement of the electrophysical and strength characteristics and Mossbauer effect parameters. Some hypotheses as to impurity behavior are presented. GRA

N75-15486# California Inst. of Tech., Pasadena. Dept. of Electrical Engineering.
ANALYSIS OF SEMICONDUCTOR STRUCTURES BY NUCLEAR AND ELECTRICAL TECHNIQUES: SILICIDE FORMATION Final Report, 1 Apr. 1973 - 30 Apr. 1974
Robert W. Bower, Wei-kan Chu, Herbert Krautle, James W. Mayer, and Marc A. Nicolet 30 Apr. 1974 63 p refs
(Contract F19628-73-C-0174; AF Proj 5638)
(AD-786459; AFCRL-TR-74-0247) Avail: NTIS CSCL 20/12

The reactions between metal layers and Si or SiO2 substrates are major considerations in choice of metallization systems for integrated circuits. Since these reactions can occur at temperatures as low as 100C, it is necessary to make the proper choice of metal layers to obtain satisfactory metal/Si contacts compatible with processing technology. In the past year (May 73 to May 74) the work at Caltech has concentrated on evaluation of silicide formation. Primary emphasis was placed on Pd, Ni and V. For some metals (Nb, V, Ti) the metal layers were deposited on SiO2 as well as Si. In this work metal layers 1000 to 4000A thick are deposited and silicide growth kinetics determined by MeV He backscattering spectrometry and phase identification by glancing angle X-ray diffraction. (Modified author abstract)
GRA

N75-15487# RAND Corp., Santa Monica, Calif.
ADVANCED CONCEPTS OF SUPERCONDUCTIVITY: A COMPARATIVE REVIEW OF SOVIET AND AMERICAN RESEARCH. PART 1: HIGH TEMPERATURE SUPERCONDUCTIVITY
Y. Ksander and S. Singer Jan. 1974 84 p refs
(Contract DAHC15-73-C-0181)
(AD-787054; R-1401-ARPA) Avail: NTIS CSCL 20C

This report reviews novel mechanisms for achieving high temperature superconductivity (HTS), the most promising of which is the exciton process. Section 1 summarizes the HTS research programs in the United States and in the U.S.S.R., from the publication of the Bardeen-Cooper-Schrieffer theory (1957) in the United States and the Ginzburg-Landau theory (1950) in the U.S.S.R., and ending with the present. The introduction also cites examples of known superconductors and their critical temperatures, and it briefly discusses the conventional applications of superconductivity. Comments are made on the tradeoff between cryogenic devices and potential HTS variants. Cautious optimism is expressed toward work on excitonic superconductors currently under way in both countries. HTS technical material is reviewed in Sections 2 and 3, which lay groundwork for the

assessment of the American and Soviet efforts in the concluding Section 4. GRA

N75-15488# University of Southern Calif., Los Angeles. Electronic Sciences Lab.
EVALUATION OF GALLIUM NITRITE FOR ACTIVE MICROWAVE DEVICES Annual Technical Report, 1 Apr. 1973 - 31 Mar. 1974
M. Gershenzon May 1975 12 p
(Contract N00014-67-A-0269-0024; NR Proj. 243-004)
(AD-787072) Avail: NTIS CSCL 20L

In designing a GaN structure for pulsed field measurement of the saturated drift velocity, it is desirable to eliminate an inhomogeneous GaN layer near the substrate interface, to reduce cracking due to differential thermal expansion between the sample and the substrate, to reduce surface conduction by maximizing the surface paths between contacts, to microscopically identify regions free of occlusions and to match the impedance of available pulsers. All of these requirements lead to the desire for thick layers of GaN. Using a two-step halide CVD growth method the authors have succeeded in depositing 2-5mm thick single crystal GaN layers on 1 x sq cm sapphire substrates. The crystals are doped 2-4 x 10 to the 18th power per cc n-type by Si contamination during growth. If the authors can now reduce this value an order of magnitude, or compensate the crystals, they should have material from which structures can be made capable of measuring drift velocity into the 10 to the 7th power cm/sec range. (Modified author abstract) GRA

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

N75-15489# Army Foreign Science and Technology Center, Charlottesville, Va.
THERMODYNAMIC FUNCTIONS OF A POLYTROPIC PROCESS
M. D. Muravev 22 Apr. 1974 23 p Transl. into ENGLISH from Teploenerg. (Moscow), no. 1, 1970 p 162-176
(AD-785972; FSTC-HT-23-1504-73) Avail: NTIS CSCL 20/13

The formulas for thermodynamic potentials of any polytropic process are derived by a method developed by the author. From these formulas, expressions are then derived formally for the thermodynamic functions of particular processes. GRA

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N75-15490*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AN ANALYSIS OF JOB PLACEMENT PATTERNS OF BLACK AND NON-BLACK MALE AND FEMALE UNDERGRADUATES AT THE UNIVERSITY OF VIRGINIA AND HAMPTON INSTITUTE Ph.D. Thesis - Virginia Univ.
Alvin Frederick Anderson 1974 125 p refs
(NASA-TM-X-72204) Avail: NTIS HC $5.25 CSCL 05I

Research questions were proposed to determine the relationship between independent variables (race, sex, and institution attended) and dependent variables (number of job offers received, salary received, and willingness to recommend source of employer contact). The control variables were academic major, grade point average, placement registration, nonemployment activity, employer, and source of employer contact. An analysis of the results revealed no statistical significance of the institution attended as a predictor of job offers or salary, although significant relationships were found between race and sex and number of job offers received. It was found that academic major, grade point average, and source of employer contact were more useful than race in the prediction of salary. Sex and nonemployment activity were found to be the most important variables in the model. The analysis also indicated that Black students received more job offers than non-Black students. Author

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N75-15491# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS, NO. 445
17 Dec. 1974 34 p refs Transl. into ENGLISH from Bulgarian reports
(JPRS-63684) Avail: NTIS HC $3.75

Articles dealing with positive-negative temperature anomalies, wind direction in the free atmosphere over Bulgaria, and freezing activity of aerosols under the influence of PbI2 are presented. For individual titles, see N75-15492 through N75-15494.

N75-15492 Joint Publications Research Service, Arlington, Va.
INVESTIGATING THE ACTIVITY OF AEROSOL OBTAINED IN BURNING A PbI,SUB2 PYROTECHNICAL COMPOSITION **c70**
N. Genadiev and P. Konstantinov *In its* Transl. of Eastern Europe, No. 445 (JPRS-63684) 17 Dec. 1974 p 1-11 refs Transl. into ENGLISH from Khidrol. Meteorol. (Sofia), no. 4, 1974 p 3-10
(For availability see N75-15491 06-81)

A comparison was made of the mean freezing temperature of a number of big individual drops under the influence of a PbI2 aerosol obtained from the burning of equivalent quantities of three pyrotechnical compositions. These compositions include no. 1 (Bulgarian), OB-1 (Soviet) and PS (Czechoslovak). Author

N75-15493 Joint Publications Research Service, Arlington, Va.
ON THE FREQUENCIES OF A FIXED DAY OF THE SUMMER MONTHS IN THE COUNTRY TO FALL IN PERIODS WITH POSITIVE OR NEGATIVE ANOMALIES OF THE MEAN DIURNAL TEMPERATURES **c47**
Stephan I. Stefanov *In its* Transl. of Eastern Europe, No. 445 (JPRS-63684) 17 Dec. 1974 p 12-18 refs Transl. into ENGLISH from Khidrol. Meteorol. (Sofia), no. 4, 1974 p 13-17
(For availability see N75-15491 06-81)

A thirty-year period, 1938 to 1967, was used to determine the normal course of mean diurnal temperature in Bulgaria. Determinations were also made of deviations from respective norms for each day of the summer months, for each station, and each year. Days with deviations ranging between 1 deg and -1 deg were classified as days with zero anomalies, i.e., days with mean diurnal temperatures ranging around the norm; days with deviations higher than 1 deg or lesser than -1 deg were classified as days with positive and days with negative anomalies of mean diurnal temperatures. A sequence of 2 or more days with identical anomalies would form a period of positive or negative anomalies of mean diurnal temperatures. The duration of such a period may be quite different, ranging from the shortest, 2 days, to the longest, 20 or more days. Author

N75-15494 Joint Publications Research Service, Arlington, Va.
WIND SEASONS IN THE FREE ATMOSPHERE OVER BULGARIA DESCRIBED **c47**
K. Stanchev, L. Milenkova, and V. Nabatova *In its* Transl. of Eastern Europe, No. 445 (JPRS-63684) 17 Dec. 1974 p 19-29 refs Transl. into ENGLISH from Khidrol. Meteorol. (Sofia), no. 4, 1974 p 19-27 (For availability see N75-15491 06-81)

A determination was made of the wind seasons in the free atmosphere over Bulgaria. The study is based on wind blow by month and main isobar levels for the period 1961 to 1970. Data are taken from radio soundings of the aerological observatory in Sofia. The wind was considered within the 8 deg system of

(N, NE, E, SE, S, SW, W, and NW). Consideration was given to frequency of wind direction only. Author

N75-15495# Army Foreign Science and Technology Center, Charlottesville, Va.
SCIENCE SYSTEM MANAGEMENT
G. Dobrov 19 Mar. 1974 8 p Transl. into ENGLISH from Nauka i Tekhn. (Riga), no. 8, 1972 p 33-36
(AD-786103; FSTC-HT-23-114-74) Avail: NTIS CSCL 08/1

Modern methods of management are essential for raising the effectiveness of scientific activity. Such management should be an organic part of a total system with clear lines of authority and a reliable flow of data between levels. Rational decision making depends on analysis, diagnosis and prognosis and aims at coordination of goal selection, work program determination and resource allocation. Models of science as a managed system may focus on informational, organizational and economic variables. Cybernetics and quantitative measures of performance are important tools for science management. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N75-15496# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES, VOLUME 28, NUMBER 8
Bruce J. McDonald and Victoria S. Hewitson 30 Aug. 1974 48 p
(AD-785726; ESN-28-8) Avail: NTIS CSCL 05/2

The monthly publication presents brief articles concerning recent developments in European scientific research. It is hoped that these articles (which do not constitute part of the scientific literature) may prove of value to American scientists by disclosing interesting information well in advance of the usual scientific publications. (Modified author abstract) GRA

N75-15497# Office of the Chief of Research and Development (Army), Washington, D.C.
PROCEEDINGS OF THE 1974 ARMY SCIENCE CONFERENCE. VOLUME 3: PRINCIPAL AUTHORS S THROUGH Z
26 Aug. 1974 438 p refs Conf. held at West Point, N. Y., 18-21 Jun. 1974
(AD-785672) Avail: NTIS CSCL 05/2

This is Volume III of the 1974 Army Science Conference Proceedings. This volume contains the unclassified papers by principal authors S thru Z which were presented at the conference, 18-21 June 1974, U.S. Military Academy, West Point, New York. GRA

N75-15498# Logistics Management Inst., Washington, D.C.
DOD TRANSPORTATION INFORMATION SYSTEMS STUDY: RECONNAISSANCE
Aug. 1974 57 p refs
(Contract ARPA SD-321)
(AD-786742; LMI-74-6) Avail: NTIS CSCL 05/2

A survey of information systems supporting the three single manager transportation operating agencies, the Military Airlift Command, the Military Sealift Command, and the Military Traffic Management and Terminal Service, is given. The information systems supporting each agency are described along with areas within or among agencies which appear subject to improvement. The performance measures used by each agency are assessed. Recommendations are offered for resolution of the more significant problem areas and improvement of agency performance measures. Author (GRA)

N75-15499# Office of the Chief of Research and Development (Army), Washington, D.C.
PROCEEDINGS OF THE 1974 ARMY SCIENCE CONFERENCE. VOLUME 1: PRINCIPAL AUTHORS A THROUGH H
26 Aug. 1974 475 p refs Presented at the 1974 Army Sci. Conf., West Point, N. Y., 18-21 Jun. 1974
(AD-785600) Avail: NTIS CSCL 05/2

This is Volume I of the 1974 Army Science Conference Proceedings. This volume contains the unclassified papers by principal authors A thru H which were presented at the conference, 18-21 June 1974, U.S. Military Academy, West Point, New York. GRA

N75-15364 Academy of Sciences (USSR), Moscow.
ONE APPROACH TO CRITERIA DESIGNATION IN PROBLEMS OF SELF-INSTRUCTION OF LONG WORD CLASSIFICATION
A. N. Lapin *In its* Probl. of Cybernetics 1974 p 172-174 refs In RUSSIAN (For availability see N75-15338 06-63)
Copyright.

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N75-15500# Committee on Banking, Housing and Urban Affairs (U.S. Senate).
SMALL BUSINESS AND THE ENERGY CRISIS
Washington GPO 1974 263 p refs Hearings on S. 2760, S. 3096, and S. 3217 before Subcomm. on Small Business of Comm. on Banking, Housing and Urban Affairs, 93d Congr., 2d Sess., 30 Apr. - 1 May 1974
(GPO-33-574) Avail: Subcomm. on Small Business

The leisure and recreation (L-R) industry is described, and the possible impacts of energy shortages, conservation and allocation measures are assessed for small business. The use of leisure time by the individual, economic magnitude of the L-R industry, leisure related expenditures, and transportation modes for L-R trips are discussed. F.O.S.

N75-15501# Chase Econometric Associates, Inc., New York.
THE EFFECT OF TAX AND REGULATORY ALTERNATIVES ON CAR SALES AND GASOLINE CONSUMPTION Final Report
May 1974 117 p
(Contract EQC-004)
(PB-234622/9) Avail: NTIS HC $5.25 CSCL 21D

Gasoline consumed by passenger vehicles for 1974-86 is predicted based on assumptions about technology, fuel efficiency, and tax and regulatory alternatives. Report forecasts new passenger car sales on an annual basis from 1974-86, and develops equations and forecasts for annual car sales by five size-price classifications. Author (GRA)

N75-15502# Massachusetts Inst. of Tech., Cambridge. Dept. of Urban Studies and Planning.
COMPARISON TESTS OF THE COLUMN COEFFICIENT AND THE GRAVITY COEFFICIENT MODELS
Zdenek Fencl and Nathaniel K. Ng Aug. 1974 99 p refs
(Contract DOT-OS-30104)
(PB-235881/0; Rept-6) Avail: NTIS HC $4.75 CSCL 05C

The study presents a comparison of the 1947, 1958, 1963, 1970, and 1980 regional outputs estimated using the column coefficient and gravity coefficient models. An evaluation is made of the accuracy of the two models in estimating 1947, 1958, and 1963 outputs. A detailed review of the industrial and regional estimation errors is provided by the authors, supplemented by appendix tables showing the errors for each of 10 industries in each of 9 regions. GRA

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N75-15503*# Texas Southern Univ., Houston.
SOCIAL COST CONSIDERATIONS AND LEGAL CONSTRAINTS IN IMPLEMENTING MODULAR INTEGRATED UTILITY SYSTEMS Final Report, Dec. 1973 - Dec. 1974
Naomi W. Lede, Hortense W. Dixon, Otis King, and Donald K. Hill Dec. 1974 250 p refs
(Grant NGR-44-016-016)
(NASA-CR-140894) Avail: NTIS HC $7.50 CSCL 05K

Social costs associated with the design, demonstration, and implementation of the Modular Integrated Utility System are considered including the social climate of communities, leadership patterns, conflicts and cleavages, specific developmental values, MIUS utility goal assessment, and the suitability of certian alternative options for use in a program of implementation. General considerations are discussed in the field of socio-technological planning. These include guidelines for understanding the conflict and diversity; some relevant goal choices and ideas useful to planners of the MIUS facility. Author

N75-15504*# Stanford Research Inst., Huntsville, Ala.
USER COMMUNITY DEVELOPMENT FOR THE SPACE TRANSPORTATION SYSTEM/SKYLAB Final Report
J. L. Archer and N. A. Beauchamp Oct. 1974 32 p refs
(Contract NAS8-30533; SRI Proj. EGU-3033)
(NASA-CR-120515) Avail: NTIS HC $3.75 CSCL 05B

The New User Function plan for identifying beneficial uses of space is described. Critical issues such as funding, manpower, and protection of user proprietary rights are discussed along with common barriers which impede the development of a user community. Studies for developing methodologies of identifying new users and uses of the space transportation system are included. F.O.S.

N75-15505# Commerce Dept., Washington, D.C.
TECHNOLOGY ASSESSMENT AND FORECAST: A REVIEW OF PATENT OWNERSHIP
Jan. 1975 139 p
Avail: NTIS HC $5.75

Patent activity data is presented in terms of the corporations and government agencies which own patents. Thus, the actual source of the technological activity from which patents result is reflected. The patent activity of the most active corporations and government agencies is examined along with the patent ownership in the technological areas of nuclear energy, coal gasification, and oil shale. Author

N75-15506# Committee on Public Works (U. S. Senate).
TRANSPORTATION PLANNING AND PRIORITIES FOR THE SEVENTIES, NEW YORK, NEW YORK, PART 1
Washington GPO 1974 129 p ref Hearing before Subcomm. on Transportation of Comm. on Public Works, 93d Congr., 2d Sess., 4 Mar. 1974
(GPO-31-360) Avail: Subcomm. on Transportation

Urban mass transit, the energy shortage, and highway finance are discussed by the Subcommittee on Transportation, New York, N.Y. M.C.F.

N75-15507# Committee on Public Works (U. S. Senate).
TRANSPORTATION PLANNING AND PRIORITIES FOR THE SEVENTIES: UNIFIED TRANSPORTATION ASSISTANCE ACT OF 1974, PART 2
Washington GPO 1974 181 p refs Hearing on S. 3035 before Subcomm. on Transportation of Comm. on Public Works, 93 Congr., 2d Sess., 12 Mar. 1974
(GPO-31-576) Avail: Subcomm. on Transportation
For abstract, see N75-15506.

N75-15508# Sandia Labs., Albuquerque, N.Mex.
ANALYSIS OF TRANSPORTATION ACCIDENT ENVIRONMENTS: THE PURPOSE, METHOD, AND INTRODUCTION
W. F. Hartman, R. K. Clarke, D. W. Larson, and J. T. Foley 1974 10 p refs Presented at the 4th Intern. Symp. on Packaging and Transportation of Radioact. Mater., Miami Beach, Fla., 22 Sep. 1974 Sponsored by AEC
(SLA-74-5374; Conf-740901-7) Avail: NTIS HC $3.25

An outline is presented of a study to determine the severity of transportation environments (air, trucks, and trains), and the overall risk for shipping hazardous materials. Areas emphasized are the frequency of accidents, the response of the cargo to the environment, and consequences if the cargo response is unfavorable. The environments analyzed include impact, crash puncture, and immersion. F.O.S.

N75-15509# Sandia Labs., Albuquerque, N.Mex.
QUANTITATIVE CHARACTERIZATION OF THE ENVIRONMENT EXPERIENCED BY CARGO IN RAILROAD ACCIDENTS
D. W. Larson, R. K. Clarke, J. T. Foley, and W. F. Hartman [1974] 22 p refs Presented at the 4th Intern. Symp. on Packaging and Transportation of Radioact. Mater., Miami Beach, Fla., 22 Sep. 1974
(SLA-74-5373; Conf-740901-12) Avail: NTIS HC $3.25

A quantitative description of the frequency and severity of train accidents is a necessary prerequisite to determining the packaging requirements for safe transport of hazardous materials by rail. This study was to provide a probabilistic description of the environments which can be expected in railroad accidents. Although it is not possible to predict the exact details of any particular accident or group of accidents, reasonable and useful approximations of the expected environment are possible using data evaluation, engineering approximations, and analytical models. Author (NSA)

N75-15510*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FEASIBILITY STUDY OF LUMINESCENT PAVEMENT MARKERS. A STUDY OF SEVEN LUMINESCENT SYSTEMS FOR WET-NIGHT VISIBILITY Interim Report, Mar. 1973 - Mar. 1974
Thomas A. Hopkins and Bruce R. Marshall Jun. 1974 62 p refs
(NASA-TM-X-72173; PB-236197/0; FHWA-RD-74-26) Avail: NTIS HC $4.25 CSCL 13B

The study was undertaken to evaluate the feasibility of adapting a bio or chemiluminescent system for use in a highway marker for wet-night lane delineation. The study involved a literature survey, theoretical evaluation of systems reported in the literature, limited laboratory verification and investigation of the visibility problem. Recommendations for further research and development are presented based on this preliminary work. The chemiluminescent reaction of siloxene derivatives is recommended because it is expected that this system can be placed in a solid matrix and activated in rainy weather by diffusion of water through a bed of solid oxidizer. The siloxene system is cheaper and more readily adaptable to use in a highway marker than several bio or chemiluminescent systems evaluated. Author (GRA)

N75-15511# Army Foreign Science and Technology Center, Charlottesville, Va.
ECONOMIC AND GEOGRAPHIC PROBLEMS OF NORTHERN TECHNOLOGY
A. P. Bulkin and V. F. Burkhanov 19 Apr. 1974 177 p Transl. into ENGLISH from the book "Ekonomicheskie i Geograficheskie Problem Severnoi Tekhaniki" Moscow, 1972 p 66-185
(AD-786791; FSTC-HT-23-0307-74) Avail: NTIS CSCL 05C

Problems experienced in developing the northern regions of the U.S.S.R. are discussed. Particular attention is paid to the materials used in building machines for the north, with emphasis being placed on effects of cold temperatures on brittle breakage of steel parts in dredges, tractors, trucks and other mining and construction equipment. Transportation networks in the north were examined, with all-terrain vehicles and hovercraft included as appropriate for the conditions. GRA

N75-15512# Army Foreign Science and Technology Center, Charlottesville, Va.
THE DEVELOPMENT OF A COMBINATION POWER INSTALLATION AND ELECTRIC DRIVE SYSTEM FOR A CITY BUS
A. E. Zorokhovich, B. P. Gushcho-Malkov, L. Ya. Levental, A. I. Khomenko, and E. M. Gorodetskii 26 Apr. 1974 13 p Transl. into ENGLISH from Tr. Mosk. Inst. Inzh. Zheleznodorozhnogo Transp. (USSR), no. 401, 1972 p 114-124
(AD-786813; FSTC-HT-23-0723-74) Avail: NTIS CSCL 13/6

The application of a combination power plant consisting of diesel generator, storage batteries and an electric drive motor for a city bus is described. The advantages and disadvantages of various types of batteries and drive system configurations are presented, along with specific data for the case of an experimental city bus. Author (GRA)

N75-15513# Carnegie-Mellon Univ., Pittsburgh, Pa. Processing Research Inst.
DETECTION OF TRACK GUIDED GROUND VEHICLES USING THE TRACK AS AN ELECTROMAGNETIC SURFACE WAVEGUIDE
Alastair D. McAulay Dec. 1973 193 p refs Sponsored by DOT
(PB-235727/5; PRI-74-103; CMUTRI-TP-73-17; UMTA-PA-11-0007-73-4) Avail: NTIS HC $7.00 CSCL 13F

The importance of vehicle detection and communication in mass transportation systems is discussed along with the advantages of track guided systems and the use of automation. Present and proposed methods of tracked vehicle detection are reviewed. An innovative method is proposed for detecting or communicating with tracked vehicles in which the track is used as an open waveguide. The characteristics of a rail as a communication channel are determined and suggestions for analyzing other parts of the system are discussed. History, definitions, and applications of electromagnetic surface waves are reviewed and behavior of two types of surface waves are presented. GRA

88 SPACE SCIENCES (GENERAL)

N75-15514*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
RESEARCH IN SPACE PHYSICS AT THE UNIVERSITY OF IOWA
J. A. VanAllen Dec. 1974 35 p refs
(Grant NGL-16-001-002)
(NASA-CR-141278) Avail: NTIS HC $3.75 CSCL 22A

Various research projects in space physics are summarized. Emphasis is placed on: (1) the study of energetic particles in outer space and their relationships to electric, magnetic, and electromagnetic fields associated with the earth, the sun, the moon, the planets, and interplanetary medium; (2) observational work on satellites of the earth and the moon, and planetary and interplanetary spacecraft; (3) phenomenological analysis and interpretation; (4) observational work by ground based radio-astronomical and optical techniques; and (5) theoretical problems in plasma physics. Specific fields of current investigations are summarized. Author

N75-15515*# Rockwell International Corp., Downey, Calif.
SD APPROVED SPACE SHUTTLE PROGRAM ACRONYMS AND ABBREVIATIONS
28 May 1974 240 p
(Contract NAS9-14000)
(NASA-CR-140310; SD74-SH-0160; T74-16574) Avail: NTIS HC $7.50 CSCL 05B

The list is prepared in two parts: Part 1 is a listing in alphabetical order by abbreviation. Part 2 is a listing of the approved abbreviations listed in alphabetical order by definition. Author

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N75-15516*# Bowling Green State Univ., Ohio. Dept. of Physics.
TIME DEPENDENT EMISSION LINE PROFILES IN THE RADIALLY STREAMING PARTICLE MODEL OF SEYFERT GALAXY NUCLEI AND QUASI-STELLAR OBJECTS
Robert Hubbard [1974] 20 p refs
(Grant NsG-7022)
(NASA-CR-141299) Avail: NTIS HC $3.25 CSCL 03A

The radially-streaming particle model for broad quasar and Seyfert galaxy emission features is modified to include sources of time dependence. The results are suggestive of reported observations of multiple components, variability, and transient features in the wings of Seyfert and quasi-stellar emission lines. Author

N75-15517*# Scientific Translation Service, Santa Barbara, Calif.
THE OPTICAL SYSTEM OF A BALLOON TELESCOPE FOR HIGH RESOLUTION FOURIER SPECTROSCOPY IN THE INFRARED SPECTRAL REGION
Reiner Hofmann Washington NASA Jan. 1975 201 p refs Transl. into ENGLISH from the German report MPI-PAE/Extraterr-103
(Contract NASw-2483)
(NASA-TT-F-16071; MPI-PAE/Extraterr-103) Avail: NTIS HC $7.25 CSCL 20F

The selection and optimization of a dispersion element for a balloon-based high resolution infrared spectroscopy project are described. The signal to noise ratio for observations of interstellar sources, dust, and other sources is given. It is demonstrated that a lamella grid is superior to the Michelson interferometer. An analysis of the entire optical system is carried out. Expressions are derived for normalized noise power of the detector and perturbation radiation, and for the optimum modulation frequency. A rocking mirror configuration is adapted for the instrument. Author

N75-15518*# Hale Observatories, Pasadena, Calif.
ATM PHOTOHELIOGRAPH Final Report
Richard A. Prout 17 Jan. 1975 52 p
(Contract NSR-05-002-071)
(NASA-CR-141947) Avail: NTIS HC $4.25 CSCL 03A

The design and fabrication are presented of a 65 cm photoheliograph functional verification unit (FVU) installed in a major solar observatory. The telescope is used in a daily program of solar observation while serving as a test bed for the development of instrumentation to be included in early space shuttle launched solar telescopes. The 65 cm FVU was designed to be mechanically compatible with the ATM spar/canister and would be adaptable to a second ATM flight utilizing the existing spar/canister configuration. An image motion compensation breadboard and a space-hardened, remotely tuned H alpha filter, as well as solar telescopes of different optical configurations or increased aperture are discussed. Author

N75-15519*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SATURN RADIO EMISSION NEAR 1 MHz
Larry W. Brown Jan. 1975 17 p refs Submitted for publication
(NASA-TM-X-70810; X-693-75-5) Avail: NTIS HC $3.25 CSCL 03A

Emission from the direction of the planet Saturn was observed by the IMP-6 spacecraft at 15 frequencies between 375 and 2200 kHz during the period April 1971 to October 1972. The

Saturnian radio bursts were identified in the IMP-6 data through an analysis of the phase of the observed modulated signal detected from the spinning dipole antenna. Initial data reduction has isolated approximately 12 storms whose occurrence corresponded to times in which the spacecraft had an unobstructed view in the direction of Saturn. These events persisted over periods between one and ten minutes. Over the span of 500 days of data another 10 to 20 Saturnian events may exist, but positive identification is confused by the presence of terrestrial noise as well as a geometric ambiguity with Jupiter. A power spectral analysis of the storm occurrence times indicates a weak periodicity at 10h 30m + or - 5m at some of the observing frequencies. The spectral character of the radiation was found analogous to that of Jupiter. Author

N75-15520*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HYDRODYNAMIC MODELS OF A CEPHEID ATMOSPHERE
Ph.D. Thesis - Maryland Univ., College Park
Alan H. Karp Nov. 1974 192 p refs
(Grant NGL-21-002-033)
(NASA-TM-X-70803; X-671-74-336) Avail: NTIS HC $7.00 CSCL 03A

A method for including the solution of the transfer equation in a standard Henyey type hydrodynamic code was developed. This modified Henyey method was used in an implicit hydrodynamic code to compute deep envelope models of a classical Cepheid with a period of 12(d) including radiative transfer effects in the optically thin zones. It was found that the velocity gradients in the atmosphere are not responsible for the large microturbulent velocities observed in Cepheids but may be responsible for the occurrence of supersonic microturbulence. It was found that the splitting of the cores of the strong lines is due to shock induced temperature inversions in the line forming region. The adopted light, color, and velocity curves were used to study three methods frequently used to determine the mean radii of Cepheids. It is concluded that an accuracy of 10% is possible only if high quality observations are used. Author

N75-15521# Royal Greenwich Observatory, Herstmonceux (England).
PROVISIONAL POSITIONS OF THE SUN AND PLANETS 1957-1971
M. E. Buontempo, J. V. Carey, and Patricia Eldridge 1973 109 p refs
(Bull-178) Avail: NTIS HC $5.25

Provisional positions of the sun and planets deduced from observations made with the Cooke Transit Circle at Herstmonceux in the years 1957 to 1971 are presented. The right ascensions are based on the system of FK4. Author

N75-15522*# Hale Observatories, Pasadena, Calif.
SUPERNOVA 1972 e IN NGC 5253
Robert P. Kirshner and J. B. Oke [1975] 30 p refs Prepared in cooperation with Carnegie Inst. of Washington, D. C.
(Grant NGL-05-002-134)
(NASA-CR-141959) Avail: NTIS HC $3.75 CSCL 03A

New absolute energy distributions of the Type 1 supernova 1972e in NGC 5253 extending to about 700 days after maximum light were obtained. A physical model of the expanding envelope, based on the identification of the feature at 6550 A with H-alpha, is proposed. It is described as a differentially expanding atmosphere, with electron density ranging from 10 to the 10th power near maximum light to about 10 to the 7th power, 340 days later, illuminated by a photosphere with temperature in the range 10,000 K to 7,000 K. More than 200 days after maximum, the spectrum was dominated by four features between 4200 A and 5500 A. Three of these four features matched the blended emissions from over 100 lines of Fe II. Possible identifications of the fourth feature with Mg I lambda 4571 or permitted lines of Fe II are also discussed. Author

N75-15523# European Southern Observatory, Geneva (Switzerland).
RESEARCH PROGRAMMES FOR THE NEW LARGE TELESCOPES
Anders Reiz, ed. Jul. 1974 415 p refs Partly in ENGLISH and partly in FRENCH Proc. of the European Southern Obs./Sci. Res. Council/CERN Conf., Geneva, 27-31 May 1974 Sponsored by Sci. Res. Council
Avail: NTIS HC $10.50

Research projects for the new large southern telescopes are featured. Magellanic clouds are studied to benefit from the high resolution, wide aperture characteristics of the large southern telescopes. Matched optical and radio investigations of quasars are discussed from the optical observation of faint objects in the Southern Hemisphere. Resources allocation, telescope time, and personnel management problems are also discussed. For individual titles, see N75-15524 through N75-15559.

N75-15524 California Inst. of Tech., Pasadena.
LARGE TELESCOPE ASTRONOMY
Jesse L. Greenstein *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 11-25 refs (For availability see N75-15523 06-89)

Large telescope applications are discussed, based on current and future research objectives in astrophysics, cosmology, etc. Associated imaging techniques, computerized data storage, and monitoring enhance the efficiency of ground based large telescopy. ESRO

N75-15525 California Inst. of Tech., Pasadena.
CURRENT RESEARCH PROGRAMMES AT THE HALE OBSERVATORIES
J. B. Oke *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 29-34 (For availability see N75-15523 06-89)

Facilities at the Hale observatories are reviewed, along with research activities on solar system astronomy, stellar spectroscopy, gaseous nebulae, galaxies, red-shifts of quasars, and identification of radio sources. ESRO

N75-15526 California Univ., Santa Cruz.
CURRENT RESEARCH PROGRAMS AT THE LICK OBSERVATORY
M. F. Walker *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 35-42 refs (For availability see N75-15523 06-89)

Research is being pursued with the 120 inch telescope, including extragalactic astronomy and pion stellar sources, interstellar material, gaseous nebulae, the structure and evolution of stars, and planetary atmospheres. Statistics show that the primary use of the telescope during dark-run has shifted from direct photography, low dispersion spectroscopy, and photoelectric photometry at the fine focus to observations with the Robinson-Wampler scanner at the Cassegrain. ESRO

N75-15527 Kitt Peak National Observatory, Tucson, Ariz.
STELLAR RESEARCH AT THE KITT PEAK NATIONAL OBSERVATORY
A. A. Hoag *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 43-52 refs (For availability see N75-15523 06-89)

The organizational structure of the observatory, allocation of telescope time, and instrumentation are reviewed. Mayall 4m telescope prime focus photography performance represents a new class of large reflectors. Telescopes are being optimized for infrared work, and infrared detectors are being developed and incorporated into telescope instrumentation. Spatial interferometry is also being used. Observational research, including spectrophotometry of galaxies, discovery of young stars by mapping techniques at visual wavelengths, and infrared mapping, are reviewed. ESRO

N75-15528 California Inst. of Tech., Pasadena.
USE OF LARGE OPTICAL TELESCOPES AT INFRARED WAVELENGTHS
E. E. Becklin *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 57-70 refs (For availability see N75-15523 06-89)

The advantage of using large telescopes for certain infrared observations lies in their high spatial and spectral resolution. Infrared observations of extragalactic sources of centers of star formation, and of the Crab nebulae pulsar are cited as characteristic high resolution examples. Simultaneous application of X-ray, infrared, and radio source detection have made it possible to resolve fine structure, as for the 2.2 mu flare in Cyg X-3. ESRO

N75-15529 Royal Greenwich Observatory, Herstmonceux (England).
SOUTHERN GLOBULAR CLUSTERS
R. J. Dickens *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 71-78 (For availability see N75-15523 06-89)

Relative age spread among globular cluster provides information on the early evolution of the galaxy. Luminosities and temperatures are measured at and below the main sequence turn-off points in the cluster high resolution diagrams, cluster distances, helium and metal abundances of their member stars and theoretical evolutionary tracks, and observations of Lyrae variables. ESRO

N75-15530 Max-Planck-Institut fuer Radioastronomie, Bonn (West Germany).
THE CENTER OF THE GALAXY
P. G. Mezger *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 79-107 refs (For availability see N75-15523 06-89)

Dominant features in the central region of our galaxy are reviewed. These are a dense stellar cluster containing about 10 to the tenth power million stars and a rapidly rotating nuclear disk. Extended nonthermal synchrotron radiation and infrared radiation come from a region which coincides approximately with the central stellar cluster. The central source consists of an extended H 11 region. A supermassive star, which may form the nucleus of our galaxy, could also be the source of ionization for the inner part of the nuclear disk. ESRO

N75-15531 Arizona Univ., Tucson. Steward Observatory.
QUASI-STELLAR OBJECT RESEARCH
P. A. Strittmatter *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 109-113 refs (For availability see N75-15523 06-89)

Line spectra of several quasars are presented, and intrinsic absorption is discussed in connection with the radiation pressure hypothesis. ESRO

N75-15532 Toronto Univ. (Ontario). David Dunlap Observatory.
FUTURE RESEARCH ON NEARBY GALAXIES
Sidney vandenBergh *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 115-121 (For availability see N75-15523 06-89)

Research on Andromeda, Triangulum, NGC 6822, IC 1613, dwarf ellipsoidal, and spheroidal companions to M31 is reviewed in order to point out areas which should use wide field Ritchey-Chretien telescopy.

N75-15533 Observatoire de Paris-Meudon (France).
THE USE OF LARGE SOUTHERN TELESCOPES FOR STUDYING INTERSTELLAR MATTER
James Lequeux *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 127-129 refs (For availability see N75-15523 06-89)

Interstellar matter, both neutral and ionized, was studied in several large northern galaxies. Studies of galactic structure and of physics of interstellar matter, especially the high resolution profiles of optical interstellar lines, are needed for the Southern Hemisphere. They clearly require the use of large telescopes with sophisticated spectrographic equipment. ESRO

N75-15534 Royal Greenwich Observatory, Herstmonceux (England).
DESIDERATA FROM THEORY OF CHEMICAL EVOLUTION OF GALAXIES **c90**
B. E. J. Pagel *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 131-142 refs (For availability see N75-15523 06-89)

The use of large space telescopes and modern digital scanners for narrow band photometric investigations, abundance analyses of giants in Magellanic Clouds, and for 10 to 30 A resolution scans covering a wide range of wavelengths in the inner core of the elliptical galaxies, is reported. Author (ESRO)

N75-15535 Observatoire de Paris-Meudon (France).
PROBLEMS ABOUT STARS AND STELLAR EVOLUTION: QUESTIONS TO OBSERVERS AND SUGGESTION FOR THE PROGRAM OF OBSERVATIONS WITH THE 360 CM OF THE EUROPEAN SPACE OBSERVATORY
E. Schatzman *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 143-152 (For availability see N75-15523 06-89)

Some of the major problems in stellar structure and evolution which may benefit from observations with large telescopes are discussed. Among such problems are stellar rotation, magnetic fields, reference atmosphere, pulsation and close binaries, and young and collapsed stars. ESRO

N75-15536 Cerro Tololo Inter-American Observatory, La Serena (Chile).
THE FUTURE OF MAGELLANIC CLOUD RESEARCH
J. A. Graham *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 159-167 refs (For availability see N75-15523 06-89)

A review is made of research on Magellanic Clouds. Particular attention was given to the use of these clouds to calibrate the distance scale of the universe. Attempts were also made to detect the metal abundance of the clouds. ESRO

N75-15537 Radcliffe Observatory, Pretoria (South Africa).
VARIABLE AND PECULIAR STARS IN THE MAGELLANIC CLOUDS
M. W. Feast *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 169-176 refs (For availability see N75-15523 06-89)

Variables related to the Cephei stars and symbiotic classes, which appear to be cool giants losing mass to a hot evolutive star are reviewed. The variability of the brighter supergiants in the Magellanic Clouds, together with carbon stars and long period Cepheids, are also discussed. ESRO

N75-15538 Australian National Univ., Canberra. Mount Stromlo and Siding Spring Observatory.
YOUNG GLOBULAR CLUSTERS IN THE MAGELLANIC CLOUDS
K. C. Freeman *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 177-187 refs (For availability see N75-15523 06-89)

The use of large astronomical telescopes to study the dynamic structure of the young clusters in the Magellanic Clouds is reported. These are similar to old clusters in the galaxy. Understanding their formation conditions and why they are no longer formed in our galaxwould help in understanding the processes which led to star formation in the collapsing protosystem. ESRO

N75-15539 Australian National Univ., Canberra. Mount Stromlo and Siding Spring Observatory.
THE MAGELLANIC CLOUDS: SOME INITIAL RESEARCH PROGRAMMES FOR THE NEW LARGE TELESCOPES
D. S. Mathewson *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 189-195 refs (For availability see N75-15523 06-89)

Three projects for the large southern telescopes are suggested: data cover a search for the member stars of the Magellanic stream, supernova remnants in the Magellanic Clouds, and the measurement of the polarization of stars in the Magellanic Clouds. ESRO

N75-15540 Padua Univ. (Italy). Inst. of Astronomy.
THE FIRST YEAR OF OBSERVATION WITH THE COPERNICUS 182 cm TELESCOPE AT ASIAGO
C. Barbieri and L. Rosino (Astrophys. Obs., Asiago, Italy) *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 199-200 (For availability see N75-15523 06-89)

Research projects carried out until now by the 182 cm Copernicus telescope at Cima Ekar comprise studies of globular clusters of variable stars and novae in galaxies of the local group and investigating on the structure of several Markarian galaxies. Auxiliary equipment was applied for spectrography and photon counting photometry. ESRO

N75-15541 Aarhus Univ. (Denmark). Inst. of Astronomy.
THE CHEMICAL COMPOSITION OF STARS AS DERIVED FROM PHOTOELECTRIC OBSERVATIONS OF NARROW-BAND INDICES OF EQUIVALENT WIDTHS
P. E. Nissen *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 201-205 refs (For availability see N75-15523 06-89)

Photoelectric observations of narrow - band indices of stellar absorption lines, with prior determination of spectral classification, radial velocity, and intermediate band photometry, can lead to determination of the chemical composition of clusters at large distances in the galaxy. This method was used to determine helium and metal abundances of early and late F type dwarfs and of K giants. ESRO

N75-15542 Science Research Council, Edinburgh (Scotland).
THE MAIN SEQUENCE TURN-OFF POINTS OF SOUTHERN GLOBULAR CLUSTERS
R. D. Cannon *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 207-208 (For availability see N75-15523 06-89)

Preliminary results of photographic and photoelectric observations of 47 Tucanae and (omega) Centauri, and NGC 6752 globular clusters are presented. Main sequence turn - off points, an important datum for fitting theoretical evolutionary tracks are located. ESRO

N75-15543 Observatoire de Paris-Meudon (France). Section d'Astrophysique.
MAY THE CURVE (MAGNITUDE V, LOG z) BE EXTENDED? [PEUT-ON PROLONGER LA COURSE (MAGNITUDE V, LOG z)?]
G. Wlerick and G. Lelievre *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 211-219 refs In FRENCH; ENGLISH summary (For availability see N75-15523 06-89)

The cosmological hypothesis for quasars with parameter more than 0.45 is used. Two components are extracted from these objects to extend the curve (V magnitude, log z) of galaxies. The high spatial resolution of the Large Space Telescope is used together with a linear bidimensional receptor. Ground based observations of color change associated with flux variations are analyzed. These considerations were applied to BL Laceatae composed of a galaxy and a bright quasar-like nucleus and to N galaxy composed of a galaxy and a miniquasar. ESRO

N75-15544 Centre National de la Recherche Scientifique, Marseilles (France). Lab. d'Astronomie Spatiale.
SURVEY OF FAINT H II REGIONS IN THE NEAREST GALAXIES BY MEANS OF THE LARGE REDUCTEUR FOCAL OF THE 193 cm TELESCOPE OF THE HAUTE PROVENCE OBSERVATORY
J. Boulesteix, G. Courtes, A. Laval, and G. Monnet (Observatoire de Marseille) *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 221-230 refs (For availability see N75-15523 06-89)

A focal corrector was applied at the Newton focus of the 193 cm telescope of the Haute Provence observatory. In this arrangement the Schmidt F/1 camera is tilted to collect the diffracted beams of an objective grating. This array was required for a survey of H II regions in galaxies M33 and M31. The capabilities of high focal ratio narrow band photography for detection of extended monochromatic sources are illustrated. ESRO

N75-15545 Centre National de la Recherche Scientifique, Marseilles (France). Lab. d'Astronomie Spatiale.
PRELIMINARY RESULTS OF THE BARANNE WHITE PUPIL IMAGE TUBE NEBULAR SPECTROGRAPH
A. Baranne, N. Carrozzi, G. Comte, G. Courtes, J. M. Deharveng, R. Duflot, G. Monnet (Observatoire de Marseille), and A. Pellet *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 231-237 refs (For availability see N75-15523 06-89)

The Baranne white pupil spectrograph optical characteristics are described. The spectrograph allows a direct picture of the astronomical object at the same time as the spectrum. This accurate check of the slit position plays an important role in the study of any fine features in the H II region of galaxies. A spectrum of the galaxies M 82 and NGC 3079 are given as an example of its performance. ESRO

N75-15546 Mullard Radio Astronomy Observatory, Cambridge (England). Cavendish Lab.
OBSERVATIONAL COSMOLOGY: RADIO ASTRONOMY AND THE MOST DISTANT GALAXIES
M. S. Longair *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 243-252 refs (For availability see N75-15523 06-89)

Fundamental topics in extragalactic physics are reviewed stressing the importance of understanding the properties of clusters of galaxies. Aspects of radio astronomy most directly related to improving the red shift - magnitude relation are discussed in detail. ESRO

N75-15547 California Inst. of Tech., Pasadena. Dept. of Astronomy.
COMPLETE SAMPLES OF 3CR AND 4C QUASARS
Maarten Schmidt *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 253-257 refs (For availability see N75-15523 06-89)
(Grant NSF GP-41053X)

Combined material derived from redshift, optical spectra, and radio observation of quasars is discussed. The need for complete samples comprised of optical and radio flux over a given area of the sky, and yielding statistical information on the space distribution of quasars, is based on their being the only astronomical objects on which it can be shown directly that their space density has been changing as a function of cosmic time. ESRO

N75-15548 Leiden Univ. Observatory (Netherlands).
WESTERBORK SYNTHESIS RADIO TELESCOPE PROGRAMMES IN THE PERSPECTIVE OF OBSERVATIONAL COSMOLOGY
H. vanderLaan and R. S. LePoole *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 259-264 (For availability see N75-15523 06-89)

As cosmological progress is now mainly dependent on statistical information derived from fainter objects, the layout of possible common areas of radio and optical telescopy is discussed. The large body of data now available requires follow up in red shift determination, multicolor photometry, and dispersion spectroscopy to gather intrinsic property data for giant galaxies and associated radio sources. Thus the Hubble diagram could be extended and quasars determined. ESRO

N75-15549 Commonwealth Scientific and Industrial Research Organization, Sydney (Australia). Div. of Radiophysics.
RESULTS FROM THE PARKES 2700 MHz SURVEY
J. V. Wall *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 265-274 refs (For availability see N75-15523 06-89)

A survey for extragalactic radio sources was started at Parkes in 1967 in anticipation of availability of large southern telescopes for correlated optical studies at 2700 MHz. The survey of each region was carried out in two stages: (1) scanning to find the sources, and (2) accurate measurements of the positions and intensities of sources found in the survey scans. Measurements were reduced by an on-line computer, the only off line analysis consisting of the application of measured pointing corrections and intensity scale factors. Results were discussed. ESRO

N75-15550 Texas Univ., Austin. Dept. of Astronomy.
STATISTICAL STUDIES OF QUASARS
D. Wills *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 275-304 refs (For availability see N75-15523 06-89)

Observationally complete samples of 4C quasars were assembled for which radio flux densities, apparent magnitude, and red shifts were measured. A statistical evaluation is discussed. ESRO

N75-15551 Eastman Kodak Co., Rochester, N.Y. Research Labs.
PHOTOGRAPHIC RECORDING AT LARGE TELESCOPES

A. G. Millikan *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 309-319 refs (For availability see N75-15523 06-89)

Recent advances in photographic detection of faint signals are reviewed to capitalize on the high resolution wide field capability of the four meter class telescopes. Faint signals with high signal to noise ratios are best detected with fast sensitive films or with careful use of a pre-flash with fast plates. It is shown that if the signal to noise ratio is low, long exposures are needed. To reduce exposure time, plate baking in a slowly moving stream of dry nitrogen or in a vacuum have produced hypersensitizing effects. ESRO

N75-15552 European Southern Observatory, Geneva (Switzerland). Sky Atlas Lab.

APPLICATIONS OF SCHMIDT TELESCOPES WITH EMPHASIS ON DIRECT AND SPECTRAL SURVEYS

Richard M. West *In its* Res. Programmes for the New Large Telescopes Jul. 1974 p 321-341 refs (For availability see N75-15523 06-89)

The capabilities and technical improvements of the Schmidt telescope are reported. It is shown that large and fairly homogeneous interference filters and large image intensifier tubes make provisions for better photographic emulsions. Locations of Schmidt telescopes are tabulated, and past direct sky surveys are listed. Subjects for future direct and spectral surveys are reviewed. ESRO

N75-15553 Science Research Council, Edinburgh (Scotland).

THE UK 48-INCH SCHMIDT TELESCOPE AND SOME CURRENT RESEARCH PROGRAMS

R. D. Cannon *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 343-345 (For availability see N75-15523 06-89)

The use of the Schmidt telescope and 3aJ plates are discussed, considering a method for photographic emulsions. It is shown that the survey materials and plate reading machines will be used for systematic optical identification of radio and X-ray sources. ESRO

N75-15554 Yale Univ. Observatory, New Haven, Conn.

THE MEASUREMENT AND ANALYSIS OF PHOTOGRAPHIC IMAGES

E. B. Newell *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 347-355 refs (For availability see N75-15523 06-89)
(Grant NSF GP-31593X)

Problems encountered in attempts to derive quantitative results from two-dimensional microdensitometer scan data are discussed. Attention is focused on the role of microdensitometer optical nonlinearities depending on the physical characteristics of both the measuring beam and sample. The need for economy in practical measurement and reduction procedures is stressed. ESRO

N75-15555 Bologna Univ. (Italy). Osservatorio Astronomico.

PLATES SENSITIZATION BY MICROSECOND PREFLASHING

A. Braccesi and F. Fusipecci *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 357-358 (For availability see N75-15523 06-89)

Flashes of 2 microseconds are investigated to bring plates in the region of maximum sensitivity. The change of sensitivity along the response characteristic curve is discussed. These hypersensitized plates are for low speed, wide field telescopes. ESRO

N75-15556 California Univ., San Diego. Dept. of Physics.

HOW TO USE LARGE OPTICAL TELESCOPES TO THE FULLEST EXTENT

G. R. Burbidge *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 363-369 (For availability see N75-15523 06-89)

Explosive growth of astronomy and extensive building of large telescopes in good astronomical sites are described along with the increasing development of sophisticated auxiliary equipment. Problem areas in scientific management are considered. Among these are compatible allocation of observing time between short, and long term projects; number of permanent, semi-permanent, and visiting staff; and how far international politics should be allowed to impinge on the choice of scientific projects, and how the advisory committee should be selected. ESRO

N75-15557 Cornell-Sydney Univ. Astronomy Center, Sydney (Australia).

CONSIDERATIONS FOR ALLOCATION OF TELESCOPE TIME

R. R. Shobbrook *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 371-372 (For availability see N75-15523 06-89)

The basis for the scheduling of the Australian share of time on the Anglo - Australian 3.8 m telescope is described. Time sharing and half night scheduling, joint programs to minimize duplication of data, routine calibration of all photographs and spectra, and flexibility of programs according to night quality are discussed for the most efficient use of the telescope. ESRO

N75-15558 Australian National Univ., Canberra. Mount Stromlo and Siding Spring Observatory

SCHEDULING TELESCOPES WITH VERY MANY USERS

K. C. Freeman *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 373-374 (For availability see N75-15523 06-89)

A two stream scheduling system requiring a small number of permanent staff is proposed for large telescopes with a large number of potential users. Stream one is for astronomers who want to conduct their own observations. Stream two is devised for astronomers who are prepared to have their observations made by the permanent observer service, in this case time would be allotted in hours and full details of program and priorities given to the observer service, which assembles all its jobs and executes them on a time sharing basis under appropriate sky conditions and in the astronomers absence. ESRO

N75-15559 Arizona Univ., Tucson. Steward Observatory.

ORGANIZATION OF TELESCOPE USE

P. A. Strittmatter *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 375-379 (For availability see N75-15523 06-89)

Personnel problems in astronomical observatories are discussed. A staff of resident or near resident astronomers is required if the instrumentation is to be maintained. Terms of appointment at the observatory for resident and visiting staff are featured. A committee of astronomers is required for suggesting time allocation to visitors. Programs fall mainly into three categories: service, directed, and statistical. Although instrument assistants are now indispensable, the astronomers' presence during most observing time is highly advisable. ESRO

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N75-15560# Academy of Sciences (USSR), Moscow. Inst. for Space Research.

ON THE NATURE OF MASER SOURCES IN INFRARED STARS

V. V. Burdjuzha and T. V. Ruzmaikina 1974 15 p refs
(PR-169) Avail: NTIS HC $3.25

It is shown that behind the shock front in the shell of an infrared star thermal instability conditions are fulfilled, which result in fragmentation of the medium. In the clouds thus formed, conditions for ignition of OH and H2O masers may be fulfilled. The 1612 - MHz spatial structure of OH sources in NML Cyg and VY CMa is discussed, as well as the problems of pumping mechanisms of OH and H2O masers. The peculiarities of microwave spectra are briefly discussed. Author (ESRO)

N75-15561# Rome Air Development Center, Griffiss AFB, N.Y.

GRAVITATIONAL RADIATION Final Report, 18 Sep. - 5 Oct. 1973

Andrew R. Pirich Sep. 1974 40 p refs

(AF Proj. 9991)
(AD-786808; RADC-TR-74-216) Avail: NTIS CSCL 20/10

Since there are several similarities between general relativity and classical electromagnetism, this leads one to ask whether gravitational waves, like electromagnetic waves, really do exist. Difficulties due to the covariant nature of general relativity arise in the definition of a gravitational wave. A question which may arise is whether the waves carry energy or whether a radiating source loses mass. No exact solutions to the field equations are available to answer this question so approximation methods are used. From these solutions, one finds that some sources do emit gravitational waves, but whether freely gravitating systems (such as the solar system) lose energy or not is a matter to be resolved. (Modified author abstract) GRA

N75-15534 Royal Greenwich Observatory, Herstmonceux (England).
DESIDERATA FROM THEORY OF CHEMICAL EVOLUTION OF GALAXIES
B. E. J. Pagel *In* European Southern Obs. Res. Programmes for the New Large Telescopes Jul. 1974 p 131-142 refs
(For availability see N75-15523 06-89)

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N75-15562*+ Colorado Univ., Boulder. Dept. of Geological Sciences.
A GEOLOGIC ANALYSIS OF MARTIAN SURFACE FEATURES FROM MARINER 9 PHOTOGRAPHY AS A BASIS FOR SYSTEMATIC GEOLOGIC MAPPING OF MARS: GEOLOGY OF THE NOACHIS QUADRANGLE, MARS Ph.D. Thesis. Final Technical Report, Mar. 1972 - Oct. 1974
James E. Peterson 1974 348 p refs
(Grants NGR-06-003-199; NGR-06-003-177)
(NASA-CR-141300) Avail: NTIS HC $9.50 CSCL 03/2

A preliminary geologic mapping of that portion of the Noaches Quadrangle photographed by Mariner 7 is presented along with geologic mapping of the entire quadrangle based on Mariner 9 imagery. The data and conclusions of these two mappings are compared. A brief summary of the geologic history of the quadrangle is presented inconclusion. J.M.S.

N75-15563* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO MISSION 17 LUNAR PHOTOGRAPHY INDEX MAPS
St. Louis, Mo. Defense Mapping Agency Aerospace Center Nov. 1973 80 p Prepared by Defense Mapping Agency Aerospace Center
(NASA-TM-X-72202) Avail: Issuing Activity CSCL 08B

An atlas is presented of photographic maps of the lunar surface. F.O.S.

N75-15564*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MARINER MARS 1971 TELEVISION PICTURE CATALOG. VOLUME 1: EXPERIMENT DESIGN AND PICTURE DATA
James A. Cutts 30 Jun. 1974 430 p refs
(Contract NAS7-100)
(NASA-CR-141966; JPL-TM-33-585-Vol-1) Avail: NTIS HC $11.25 CSCL 03B

A compilation of Mariner 9 television data is presented for the study of the planet Mars and of its two satellites, Phobos and Deimos. The concept of the basic mission, camera characteristics, and various processing techniques of the raw television data recovered from the spacecraft are discussed. Data are arranged into the following disciplines: (1) mapping and geology, (2) polar studies, (3) geodesy, (4) variable surface features, (5) atmospheric phenomena, and (6) satellites. Reproduction and arrangements of approximately 3000 individual pictures and photomosaics are provided. Author

N75-15565*# Kanner (Leo) Associates, Redwood City, Calif.
TEMPERATURE AND STRUCTURE OF THE MOON ACCORDING TO ELECTRICAL CONDUCTIVITY DATA ON ITS INTERIOR
A. Okulesskiy Washington NASA Jan. 1975 13 p refs Transl. into ENGLISH of "K Voprosy o Temperature i Strukture Luny Podannym Elektroprovodnosti yeye Nedr", Pr-167, Acad. of Sci. USSR, Moscow, 1974 p 1-16
(Contract NASw-2481)
(NASA-TT-F-16116; Pr-167) Avail: NTIS HC $3.25 CSCL 03B

Based on the familiar temperature dependence of conductivity, which relates electrical conductivity to parameters characterizing the petrological composition of rocks, a temperature estimate of the lunar interior was obtained: the temperature within the moon rises sharply from 250 K in the near-surface layer to 800 K at 200 km from the surface and then, beginning from 400 km, tends to its adiabatic value, reaching 1050 K at 600 km. Three major regions of the lunar interiors can be distinguished: 0-200 km, 200-600 km, and the region lying below 600 km (pyroxenitic, peridotitic, and olivinic shells, respectively). Author

N75-15566*# Scientific Translation Service, Santa Barbara, Calif.
STRUCTURE AND DYNAMICS OF THE THERMOSPHERE OF VENUS
M. N. Izakov Washington NASA Jan. 1975 27 p refs Transl. into ENGLISH of "Struktura i Dinamika Termosfery Venergy", Acad. of Sci., Moscow, PR-176, 1974 32 p
(Contract NASw-2483)
(NASA-TT-F-16112; PR-176) Avail: NTIS HC $3.75 CSCL 03B

The temperature, density, and velocity distributions of macroscopic motion in the Venus thermosphere are calculated, taking into account their interreactions of altitudes of 110 - 210 km for moderately high solar activity. It is shown that the absorption of solar radiation on the diurnal (daylight) side causes a global circulation with vertical upward motion on the diurnal side, and downward on the nocturnal side with velocities of several meters per second, and with horizontal velocities up to several hundred m/sec away from the subsolar point in the upper thermosphere. The temperature distribution in the Venus thermosphere is characterized by a temperature drop from day to night of 800 K at the subsolar point, to 300 K at the antisolar points. The calculated temperatures are close to the experimental ones if the variability of the temperature with solar activity is taken into account. Author

N75-15567*# Scientific Translation Service, Santa Barbara, Calif.
VOLATILIZATION IN A VACUUM OF ELEMENTS FROM MELTS OF PLANETARY SURFACE MATERIALS
M. D. Nusinov and Yu. B. Chernyak Washington NASA Jan. 1975 32 p refs Transl. into ENGLISH of "Ob Uletuchivanii v Vakuume Elementov iz Rasplavov Poverkhnostnogo Veshchestva Planet", Pr-188, Acad. of Sci. USSR, Moscow, 1974 p 1-35
(Contract NASw-2483)
(NASA-TT-F-16107; Pr-188) Avail: NTIS HC $3.75 CSCL 03B

A physical model is worked out and a theory is presented on the basis of an analysis of the experimental data for the process of vaporization of volatile components of molten rock in vacuum, taking into account the adsorption of gases from the residual atmosphere. As a result, several preliminary conclusions are presented relative to such phenomena on the moon and their laboratory modeling. Author

N75-15568*# Stanford Univ., Calif. Radioscience Lab.
INVESTIGATION OF OUTER PLANET ATMOSPHERES USING THE PIONEER ENTRY PROBE RADIO SYSTEM Final Report
Thomas A. Croft Dec. 1974 94 p refs
(Grant NsG-2017)
(NASA-CR-141324; SU-SEL-74-053) Avail: NTIS HC $4.75 CSCL 03B

The requirements for a telecommunication link which will relay information from a space probe to a carrier spacecraft

during space exploration missions are examined. Specific experiments are described and the relative value of the proposed techniques are evaluated. Radio science methods as related to telecommunications systems are discussed. Operational implications of the various approaches to scientific measurement by telemetry of tracking radios are analyzed. Emphasis is placed on a conceptual description of the physics rather than the mathematical development. Author

N75-15569*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
OPTICAL STUDIES OF METEORS AT MOUNT HOPKINS OBSERVATORY Final Report, 1 Mar. - 30 Nov. 1974
Trevor C. Weekes and J. T. Williams 30 Nov. 1974 15 p refs
(Grant NsG-8006)
(NASA-CR-140893; SAO-412-097) Avail: NTIS HC $3.25 CSCL 03A

The 10-m optical reflector and an array of phototubes are used to extend the optical measurements beyond the present limit achieved by the Vidicon system. The first detection of optical meteors with M sub v = + 12 is reported. It is hoped that this system can be used to determine intermediate points in the meteor frequency mass curve for sporadic meteors and to study in detail the faint components of meteor showers. Preliminary observations made on three nights in September 1974 are presented. Author

N75-15570*# Toronto Univ. (Ontario). Dept. of Geology.
SURFACE ELECTRICAL PROPERTIES EXPERIMENT, PART 1 Final Technical Report
D. W. Strangway, A. P. Annan, J. D. Redman, J. R. Rossiter, J. A. Rylaarsdam, and R. D. Watts Sep. 1974 489 p refs Prepared for MIT, Cambridge
(Contract NAS9-11540)
(NASA-CR-141471) Avail: NTIS HC $12.00 CSCL 03B

The work is reported which was performed on the Surface Electrical Properties Experiment Data Acquisition System. Areas discussed include: data handling and processing, installation and external signal application, operation of the equipment, and digital output. Detailed circuit descriptions are included. F.O.S.

N75-15571*# Toronto Univ. (Ontario).
SURFACE ELECTRICAL PROPERTIES EXPERIMENT, PART 2 Final Technical Report
D. W. Strangway, A. P. Annan, J. D. Redman, J. R. Rossiter, J. A. Rylaarsdam, and R. D. Watts Sep. 1974 290 p refs Prepared for MIT, Cambridge
(Contract NAS9-11540)
(NASA-CR-141472) Avail: NTIS HC $8.75 CSCL 03B

For abstract, see N75-15570.

N75-15572*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ON THE MOON WITH APOLLO 17: A GUIDEBOOK TO TAURUS-LITTROW
Gene Simmons Dec. 1972 115 p refs
(NASA-EP-101) Avail: NTIS MF $2.25; SOD HC $1.00 CSCL 22C

The Apollo 17 mission is discussed and illustrated. Lunar surface and orbital experiments are briefly described, and results are outlined. N.E.R.

N75-15573*# Techtran Corp., Glen Burnie, Md.
MARS-3: INFRARED TEMPERATURES AND THERMAL PROPERTIES OF THE PLANET'S SURFACE
V. I. Moroz, L. V. Ksanfomaliti, B. N. Krasovskiy, V. D. Davydov, N. A. Parfentyev, V. S. Zhegulev, and G. F. Filippov Washington NASA Dec. 1974 41 p refs Transl. into ENGLISH of "Mar-3: Infrakrasnyye Temperaturyi Teplovyye Svoystva Poverkhnosti Planety", Pr-172, Acad. of Sci. USSR, Moscow, 1974 51 p
(Contract NASw-2485)
(NASA-TT-F-15914; PR-172) Avail: NTIS HC $3.75 CSCL 03A

The infrared radiometer installed on Mars-3 is described and the results of six series of observations from 15 December 1971 to 28 February 1972 are outlined. Conclusions on the thermal properties and physical structure of the Martian are in agreement with the results of similar observations made by Mariner-9. Author

N75-15574*# California Inst. of Tech., Pasadena. Physics Dept.
DIFFUSION MODELS FOR JUPITER'S RADIATION BELT
S. A. Jacques and Leverett Davis, Jr. 10 Nov. 1972 34 p refs Prepared for JPL
(Grant NGR-05-002-160)
(NASA-CR-141967) Avail: NTIS HC $3.75 CSCL 03B

Solutions are given for the diffusion of trapped particles in a planetary magnetic field in which the first and second adiabatic invariants are preserved but the third is not, using as boundary conditions a fixed density at the outer boundary (the magnetopause) and a zero density at an inner boundary (the planetary surface). Losses to an orbiting natural satellite are included and an approximate evaluation is made of the effects of the synchrotron radiation on the energy of relativistic electrons. Choosing parameters appropriate to Jupiter, the electrons required to produce the observed synchrotron radiation are explained. If a speculative mechanism in which the diffusion is driven by ionospheric wind is the true explanation of the electrons producing the synchrotron emission it can be concluded that Jupiter's inner magnetosphere is occupied by an energetic proton flux that would be a serious hazard to spacecraft. Author

N75-15575*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DATA CATALOG OF SATELLITE EXPERIMENTS. SUPPLEMENT NO. 2D: PLANETOLOGY
Dec. 1974 88 p
(NASA-TM-X-72538; NSSDC-74-15D-suppl-2D) Avail: NTIS HC $4.75 CSCL 22B

Spacecraft, experiment, and data sets are presented of lunar explorations. Apollo lunar surface experiments are listed and brief discriptions are included. Areas of data include: astronomy, meteorology, planetology, and solar physics. M.C.F.

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N75-15576*# California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
SUPPORT OF THE THIRD SOLAR WIND CONFERENCE Final Report, 1 Jan. - 31 Dec. 1974
Christopher T. Russell, P. J. Coleman, Jr., and C. P. Sonett Jan. 1975 13 p refs Presented at the 3rd Solar Wind Conf., Pacific Grove, Calif., 25-29 Mar. 1974
(Grant NsG-7008)
(NASA-CR-140900; Publ-1428-77) Avail: NTIS HC $3.25 CSCL 03B

The program of invited talks at the Third Solar Wind Conference is provided, with a table of contents of the proceedings. N.E.R.

N75-15577*# California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
THE THIRD SOLAR WIND CONFERENCE: A SUMMARY
Christopher T. Russell Jul. 1974 29 p Conf. held at Pacific Grove, Calif., 25 - 29 Mar. 1974 Revised
(Grant NsG-7008)
(NASA-CR-141322; NASA-SP-308; Publ-1354-51-Rev) Avail: NTIS CSCL 03B

The Third Solar Wind Conference consisted of nine sessions. The following subjects were discussed: (1) solar abundances; (2) the history and evolution of the solar wind; (3) the structure and dynamics of the solar corona; (4) macroscopic and microscopic properties of the solar wind; (5) cosmic rays as a probe of the solar wind; (6) the structure and dynamics of the solar wind; (7) spatial gradients; (8) stellar winds; and (9) interactions with objects in the solar wind. The invited and contributed talks presented at the conference are summarized. Author

N75-15578# National Oceanic and Atmospheric Administration, Boulder, Colo.
MASTER STATION LIST FOR SOLAR-TERRESTRIAL PHYSICS DATA AT WDC-A FOR SOLAR-TERRESTRIAL PHYSICS
R. W. Buhmann, Juan D. Roederer, (Denver Univ.), M. A. Shea, (AFCRL), and D. F. Smart, (AFCRL) Asheville, N. C. Environ. Data Serv. Dec. 1974 117 p refs
(UAG-38) Avail: NTIS MF $2.25; National Climate Center, Federal Building, Asheville, N. C. 28801. Attn: Publications HC $1.60

Information is collected on the locations of stations or observatories active in one or more of the disciplines of solar-terrestrial physics and participating in the data exchange through the World Data Centers. It also includes stations operating before the data exchange arrangements initiated for the International Geophysical Year (1957-58) for which data are held at World Data Center A for solar-terrestrial physics. Some additional stations are included which are proposed for operation during international magnetospheric study. Author

N75-15579# Sandia Labs., Albuquerque, N.Mex.
SOLAR ULTRAVIOLET IRRADIANCE AND OZONE PARTICLE CONCENTRATION OBSERVATIONS AT 48 KILOMETERS BALLOON-FLOAT ALTITUDE
R. L. Schellenbaum May 1974 10 p refs
(Contract AT(29-1)-789)
(SLA-74-104) Avail: NTIS HC $3.25

Observations of solar ultraviolet irradiance in the Hartley Band were made with a balloon-borne filter wheel photometer at 42 to 48.5 km float-altitude during sunrise. Solar flux measurements were obtained at four wavelengths during a period of three hours. Total slant ozone column concentrations and ozone particle concentrations as a function of solar zenith angle were derived and found to compare favorably with other experimental results. The effects of ozone photodissociation and recombination are noted. Author (NSA)

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N75-15580*# Maryland Univ., College Park. Dept. of Physics and Astronomy.
PROPAGATION OF COSMIC RAYS IN THE GALAXY
R. R. Daniel and S. A. Stephens [1974] 208 p refs Submitted for publication
(Grants NGR 21-002-066; NGR-21-002-224; NGR-21-002-316; NSF GP-25305)
(NASA-CR-141190; TR-75-028) Avail: NTIS HC $7.25 CSCL 03B

The characteristics of a model for analyzing the propagation of cosmic rays are discussed. The requirements for analyzing the relevant observational data on cosmic rays are defines as: (1) the chemical and isotopic composition of cosmic rays as a function of energy, (2) the flux and energy spectrum of the individual nucleonic components, (3) the flux and energy spectrum of the electronic component, (4) the cosmic ray prehistory, and (5) the degree of isotropy in their arrival directions as a function of energy. It is stated that the model which has been able to bring to pass the greatest measure of success is the galactic confinement model. Author

N75-15581*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HIGH ENERGY GALACTIC GAMMA RADIATION FROM COSMIC RAYS CONCENTRATED IN SPIRAL ARMS
G. F. Bignami, C. E. Fichtel, D. J. Thompson, and D. A. Kniffen Dec. 1974 21 p refs Submitted for publication
(NASA-TM-X-70818; X-662-75-2) Avail: NTIS HC $3.25 CSCL 03A

A model for the emission of high energy (> 100 MeV) gamma rays from the galactic disk was developed and compared to recent SAS-2 observations. In the calculation, it is assumed that (1) the high energy galactic gamma rays result primarily from the interaction of cosmic rays with galactic matter; (2) on the basis of theoretical and experimental arguments the cosmic ray density is proportional to the matter density on the scale of galactic arms; and (3) the matter in the galaxy, atomic and molecular, is distributed in a spiral pattern consistent with density wave theory and the experimental data on the matter distribution. Author

N75-15582*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COSMIC RAY COMPOSITION MEASUREMENTS AND HIGH ENERGY IONIZATION SPECTROMETERS
John F. Arens and Jonathan F. Ormes Sep. 1974 44 p refs Submitted for publication
(NASA-TM-X-70802; X-661-74-335) Avail: NTIS HC $3.75 CSCL 03B

Element abundances of cosmic rays Li through Si with energy above 0.8 GeV/amu were measured on a balloon borne instrument containing a total absorption ionization spectrometer. Statistical techniques were used to analyze the five measurements of each particle to determine its charge and energy. The technique allows a determination of systematic errors to be made. Corrections for Landau fluctuations, spark chamber inefficiency, and background particles were included. Comparison with other published results is made. Differences in the shape of the spectrum determined from measurements of different workers indicate that the absolute intensity is still known to only plus or minus 15% between 2 and 10 GV/c rigidity. Author

N75-15583*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOLAR GAMMA RAYS
Reuven Ramaty, B. Kozlovsky, and R. E. Lingenfelter Dec. 1974 95 p refs Submitted for publication
(Grant NSF GP-31620)
(NASA-TM-X-70808; X-660-74-368) Avail: NTIS HC $4.75 CSCL 03B

The theory of gamma ray production in solar flares is treated in detail. Both lines and continuum are produced. Results show that the strongest line predicted at 2.225 MeV with a width of less than 100 eV and detected at 2.24 + or - 2.02 MeV, is due to neutron capture by protons in the photosphere. Its intensity is dependent on the photospheric He-3 abundance. The neutrons are produced in nuclear reactions of flare accelerated particles which also produce positrons and prompt nuclear deexcitation lines. The strongest prompt lines are at 4.43 MeV from c-12 and at approximately 6.2 from 0-16 and N-15. The gamma ray continuum, produced by electron bremsstrahlung, allows the determination of the spectrum and number of accelerated electrons in the MeV region. From the comparison of the line and continuum intensities a proton-to-electron ratio of about 10 to 100 at the same energy for the 1972, August 4 flare. For the same flare the protons above 2.5 MeV which are responsible for the gamma ray emission produce a few percent of the heat generated by the electrons which make the hard X rays above 20 keV. Author

N75-15584*# National Aeronautics and Space Administration, Washington, D.C.
PHYSICS OF COSMIC RAYS
V. S. Murzin Dec. 1974 285 p refs Transl. into ENGLISH of the book "Fizika Kosmicheskikh Luchey" Moscow, Moscow Univ. Press, 1970 p 1-282 Sponsored in part by NSF
(NASA-TT-F-16171; TT-73-58027) Avail: NTIS HC $8.75 CSCL 03B

A textbook on cosmic ray physics is presented. N.E.R.

N75-15585*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
IRRADIATION AND MEASUREMENTS OF FLUORINATED ETHYLENE-PROPYLENE-A ON SILICON SOLAR CELLS IN VACUUM
Stanley J. Marsik and Jacob D. Broder Washington Jan. 1975 12 p refs
(NASA-TM-X-3189; E-8109) Avail: NTIS HC $3.25 CSCL 10A

Silicon monoxide (SiO) coated silicon solar cells covered with fluorinated ethylene-propylene-A (FEP-A) were irradiated by 1-MeV electrons in vacuum. The effect of irradiation on the light transmittance of FEP-A was checked by measuring the short-circuit current of the cells while in vacuum after each dose increment, immediately after the irradiation, and again after a minimum elapsed time of 16 hr. The results indicated no apparent loss in transmission due to irradiation of FEP-A and no delamination from the SiO surface while the cells were in vacuum, but embrittlement of FEP-A occurred at the accumulated dose. Author

N75-15586# Denver Univ., Colo.
THE 13th INTERNATIONAL COSMIC RAY CONFERENCE. VOLUME 2: MG AND SP SESSIONS
Aug. 1973 1150 p refs Conf. held at Denver, 17-30 Aug. 1973
(Conf-730804-P2) Avail: NTIS HC $29.25

Modulation and geophysical effects, along with energetic solar particles and photons are presented. High energy electrons, gamma and X-ray sources are among topics discussed. Abstracts are included for all presentations. M.C.F.

N75-15587# Academy of Sciences (USSR), Moscow. Inst. for Space Research.
STUDY OF SOLAR PLASMA NEAR MARS AND ALONG THE EARTH TO MARS PATH BY MEANS OF CHARGED PARTICLE TRAPS ABOARD THE SOVIET SPACECRAFTS, LAUNCHED IN 1971-1973. PART 1: TECHNIQUES AND DEVICES
K. I. Gringauz, K. I. Bezrukikh, G. I. Volkov, M. I. Verigin, L. N. Davitaev, V. F. Kopylov, L. S. Musatov, and G. F. Sloutchenkov
1974 26 p refs
(PR-179) Avail: NTIS HC $3.75

Experiments on the study of plasma near Mars and along the Earth to Mars path which were performed aboard six spacecrafts launched in 1971 and 1973 are described. The specifications of the modulation-type ion trap and the retarding potential electron analyzer (trap) are given. Peculiarities of plasma measurements on oriented spacecrafts are considered. Results of laboratory tests of the devices and samples of primary results of onboard measurements in space are presented.
Author (ESRO)

N75-15588# Academy of Sciences (USSR), Moscow. Inst. for Space Research.
STUDY OF SOLAR PLASMA NEAR MARS AND ALONG THE PATH EARTH-MARS BY MEANS OF CHARGED PARTICLE TRAPS ON SOVIET SPACECRAFTS, 1971-1973. PART 2: CHARACTERISTICS OF ELECTRON COMPONENT ALONG ORBITS OF ARTIFICIAL SATELLITES OF MARS (MARS-2 AND MARS-5)
K. I. Gringauz, V. V. Bezrukikh, T. K. Breus, M. J. Verigin, G. I. Volkov, and A. V. Dyachkov 1974 41 p refs
(PR-180) Avail: NTIS HC $3.75

Results of measurements of characteristics of the solar wind electron component and near planet plasma by means of charged particle traps with retarding potentials installed at artificial satellites of the Mars, Mars-2 and Mars-3 are presented. The near planet shock wave is detected. Behind the shock wave front the electron density and the temperature substantially increase and electrons with E greater than or approximately equal to 50 + 70 ev are observed. The average distance from the Mars surface to the shock wave front is estimated as 2500 km and to the obstacle forming the shock wave 1400 km.
Author (ESRO)

N75-15589# Aerospace Corp., El Segundo, Calif. Lab. Operations.
RELATIVE CORONAL ABUNDANCES DERIVED FROM X-RAY OBSERVATIONS. 3: THE EFFECT OF CASCADES ON THE RELATIVE INTENSITY OF Fe 17 LINE FLUXES, AND A REVISED IRON ABUNDANCE
Arthur B. Walker, Jr., Hugo R. Rugge, and Kay Weiss 1 Oct. 1974 43 p refs
(Contract F04701-74-C-0075)
(AD-787204; TR-0075(9260-02)-1; SAMSO-TR-74-218) Avail: NTIS CSCL 03/2

Lines of Fe XVII are prominent in the coronal spectrum below 25 A. The intensities of the lines of the 2p-3d transitions near 15 A have been used in conjunction with coronal models, and the assumption that the excited states are populated only by collisional excitation from the ground state (coronal excitation), to determine the Fe abundance. Eight lines of Fe XVII were observed which originated from the (2p)5(3s), (2p)5(3d) and (2s)(2p)6(3d) configurations in the coronal spectrum between 13 and 18 A. Using a more complete theoretical model, and higher resolution observations which allow a number of line blends to be resolved, the authors have revised earlier calculation of the coronal abundance of Fe, and find an iron abundance relative to hydrogen of .000026, which is in excellent agreement with the photospheric iron abundance. (Modified author abstract)
GRA

99 GENERAL

N75-15590# National Academy of Engineering, Washington, D.C.
PRIORITIES FOR RESEARCH APPLICABLE TO NATIONAL NEEDS
1973 142 p
Avail: NTIS HC $5.75

Research Applied to National Needs (RANN) is discussed in a broad study and review of problem oriented research priorities. Common themes, procedures, and strategies are presented which describe the origins of the RANN program, along with principal objectives for understanding and improving institutional and technical techniques. Also discussed are research recommendations in the area of community development and human resources. M.C.F.

N75-15591# Melbourne Univ., Parkville (Australia).
[CATALOGUE LISTING OF RESEARCH PROJECTS AND PERSONNEL] Research Report Summary, 1 Mar. 1973 - 28 Feb. 1974
1973 536 p
Avail: NTIS HC $12.50

Research projects and personnel of the University of Melbourne are presented. The following major areas are included: agriculture and forestry, dental science, social studies, medicine, engineering, veterinary science, and education. J.M.S.

N75-15592# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario). Behavioural Sciences Div.
VISUAL SEARCH CAPABILITY IN SEARCH AND RESCUE (SAR)
Paul Stager May 1974 68 p refs
(DCIEM-74-R-1009) Avail: NTIS HC $4.25

Visual search methods of the Search and Rescue organization of the Canadian Forces are investigated. Problem areas bearing on the effectiveness of visual searching are discussed, including: (1) squadron equipment and obligations; (2) rescue coordination centers; (3) spotters and visual search; and (4) determining SAR effectiveness. Factors affecting the effectiveness of visual search, such as target, aircraft and observer/spotter variables are described. Dynamic visual research requirements in SAR are included along with implications for improving visual searching. Recommendations intended to optimize visual search capability are given suggesting modifications in training, search methods, human resources, and SAR facilities. The report indicates that unless the SAR organization can optimize all integral aspects of the system, the potential capability of visual searching cannot be realized. J.M.S.

N75-15593# Committee on the Judiciary (U. S. Senate).
FEDERAL DATA BANKS AND CONSTITUTIONAL RIGHTS. A STUDY OF DATA SYSTEMS ON INDIVIDUALS MAINTAINED BY AGENCIES OF THE UNITED STATES GOVERNMENT
Washington GPO 1974 59 p refs Prepared by Subcomm. on Constitutional Rights of Comm. on the Judiciary, 93d Congr., 2d Sess., 1974

(GPO-35-024) Avail: SOD HC $0.65

A comprehensive survey of government data banks is presented. The survey was undertaken as a precondition to legislative activity to protect privacy. An absence of laws to control the information capabilities of government is disclosed along with an absence of knowledge of what data banks the government has, what they contain, and what their purpose is. Results of the survey are discussed in detail. J.M.S.

N75-15594*# National Aeronautics and Space Administration, Washington, D.C.

INFORMATION ABOUT THE 73-ASTRONAUTS SELECTED BY THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION SINCE 1959

Jan. 1975 21 p

(NASA-TM-X-72186; NASA-News-Release-75-20) Avail: NTIS HC $3.25 CSCL 05D

Information about the 73 pilots and scientists selected as astronauts is presented. J.M.S.

N75-15595# Advisory Group for Aerospace Research and Development, Paris (France).

DIRECTOR'S ANNUAL REPORT TO THE NORTH ATLANTIC MILITARY COMMITTEE

1973 83 p refs

Avail: NTIS HC $4.75

The activities of AGARD are reviewed. The following panel programs are discussed: (1) aerospace medicine; (2) avionics; (3) electromagnetic wave propagation; (4) flight mechanics; (5) fluid dynamics; (6) guidance and control; (7) propulsion and energetics; (8) structures and materials; and (9) technical information. The meetings held, the publication produced, and consultant services rendered are presented. J.M.S.

N75-15596# Army Advanced Ballistic Missile Defense Agency, Huntsville, Ala.

RESOURCE ALLOCATION AND SCHEDULING IN BALLISTIC MISSILE DEFENSE ADAPTIVE CONTROL SYSTEMS

Doyce E. Satterfield 1974 13 p refs

(AD-785676) Avail: NTIS CSCL 15/3

The radar and computer system can be considered as the eyes and brain of a ballistic missile defense (BMD) system. Given no limitation on resources, a ballistic missile system's operational philosophy may be to utilize predetermined battle plans for the allocation of radar and computer resources. However, it is rarely economically feasible to provide excessive resources, and, since the defensive and offensive situation changes dynamically, it becomes imperative that the allocation of such resources adapt to these changes. This paper treats the radar and computer system as an adaptive control system in which the allocation of the computer preprocessing rate, radar pulse rate, and computer postprocessing rate are varied dynamically. To determine the optimal real-time allocation of the radar and computer resources, the problem was first formulated mathematically and then solved in two phases. GRA

N75-15597# Air Force Human Resources Lab., Brooks AFB, Tex.

THE VALUE OF AN AIR COMBAT MANEUVERING RANGE TO THE TACTICAL AIR COMMAND

Joe A. Fitzgerald Jun. 1974 9 p

(AF Proj. 1123)

(AD-786850; AFHRL-TR-74-52) Avail: NTIS CSCL 14/2

The author takes the position that the Tactical Air Command needs an instrumented range for training in air-to-air combat-Air Combat Maneuvering Range (ACMR) as early as possible, and makes a case for a coordinated plan of utilization for the Simulator for Air-to-Air Combat (SAAC) and an ACMR. It is asserted that the complimentary capabilities of the two systems can make important contributions to tactical fighter training, tactics development, and simulator development. Author (GRA)

N75-15598# RAND Corp., Santa Monica, Calif.

PROBE 1: A DIFFERENTIAL EQUATION MODEL FOR COMPARING FIGHTER ESCORT AND AIRBASE ATTACK SYSTEMS IN A COUNTER-AIR OPERATION

F. A. Tatum and L. N. Rowell Jul. 1974 135 p refs

(Contract F44620-73-C-0011)

(AD-786023; R-1413-PR) Avail: NTIS CSCL 15/7

PROBE I models an attack air force versus an interceptor defense in a conflict extending over as many as thirty missions. For any mission, the attack sorties may be allocated to any combination of (1) aircraft with bombs only, assigned to prime targets, (2) similar aircraft targeting hostile interceptor bases, or (3) aircraft with only air-combat weapons that defend the bombers. The model shows the results of one or a series of missions in which the experimenter specifies the allocations; alternatively, it can determine, mission-by-mission, the allocations that (with the total number of missions specified) will maximize a given objective, such as total bomb tonnage reaching prime targets. The heart of the model is a set of differential equations that represent the rates at which aircraft change from one state to another, e.g., loaded to unloaded -- engaged to disengaged, etc. PROBE I is programmed for the IBM 370/158. Author (GRA)

N75-15599# Kaman Avidyne, Burlington, Mass.

EVALUATION OF BACK-BLAST PRESSURES PRODUCED BY A WING-MOUNTED 105-mm RECOILLESS RIFLE Final Report, Oct. 1972 - Jul. 1973

William N. Lee, Robert Similey, J. Ray Reutenik, and Norman P. Hobbs Jul. 1974 71 p refs

(Contract DAAF07-73-C-0163; DA Proj. 1F1-63206-D-050)

(AD-786528; KA-TR-97; WVT-CR-74023) Avail: NTIS CSCL 19/6

Results are presented from an analytical study to develop means of reducing the back-blast pressures produced on the tail boom of an AH-1G helicopter by the firing of a 105-mm wing-mounted recoilless rifle. Computer codes were developed for predicting the back-blast fields and are partially substantiated by comparisons of calculated pressures with results from recent Picatinny firing tests. The desirability of reducing back-blast pressures through use of a multiple nozzle and by varying the firing chamber pressure profile is explored. It is found that the blast-field pressures can be reduced significantly by decreasing the average chamber pressure during the first 4 milliseconds after diaphragm burst. Author (GRA)

N75-15600# Bell Aerospace Co., New Orleans, La.

WAVE-SES STUDY Technical Report, Jul. - Aug. 1974

26 Aug. 1974 7 p

(Contract N00014-74-C-0289)

(AD-785874) Avail: NTIS CSCL 13/10

The object of this study is to evaluate the potential performance of a 2,000 ton Surface Effect Ship (WAVE-SES) propelled by a water augmented propulsion air flow. GRA

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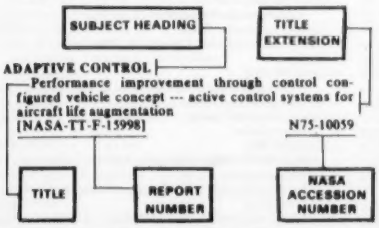
TYPICAL SUBJECT INDEX LISTING



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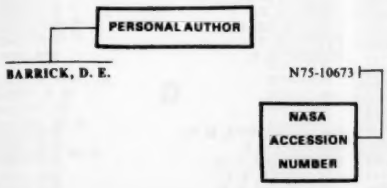

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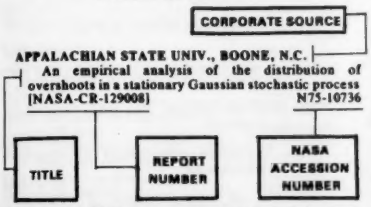

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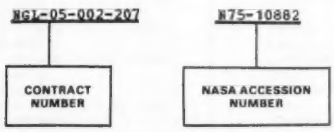

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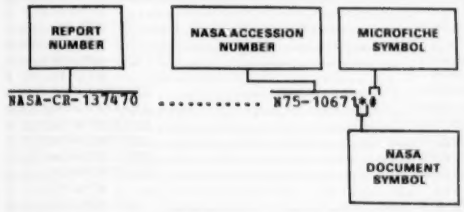

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D6-60178-1-VOL-1 ..... N75-14929 #
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ECOM-72-0061-4 ..... N75-14969 #
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ESDU-67034-AMEND-A ..... N75-15049 +
ESDU-71016-AMEND-A-AMEND-B ..... N75-14988 +

ESL-P-569 ..... N75-15384*#
ESL-P-572 ..... N75-15386*#

ESN-28-8 ..... N75-15496 #

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EUR-5138 ..... N75-15267 #

E75-10016 ..... N75-15101*#
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FAA-RD-74-102 ..... N75-14936 #
FAA-RD-74-108 ..... N75-14962 #
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FSTC-HT-23-0156-74 ..... N75-14944 #
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JSC-IN-73-FM-53 ..... N75-15332*#
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LMSC-D424228 ..... N75-14820*#
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MSC-2321 ..... N75-15023 #

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NADC-74151-30 ..... N75-15060 #

NAMRL-1204 ..... N75-15303 #
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NASA-CASE-LEW-11484-2 ..... N75-14839*#

NASA-CASE-MFS-21244-1 ..... N75-15028*
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NASA-CASE-MSC-12617-1 ..... N75-15019*#
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NASA-CR-2347 ..... N75-14831*#
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US-PATENT-APPL-SN-847815 ..... N75-15270*

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US-PATENT-3,849,554 ..... N75-15270*
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USAAMRDL-TR-74-44 ..... N75-14752 #
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USGS-WRI-22-74 ..... N75-15098 #

USGS/WRD-74-028 ..... N75-15098 #

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WVT-TR-74039 ..... N75-15083 #

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X-602-74-359 ..... N75-15436*#
X-621-74-350 ..... N75-15392*#
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X-923-74-313 ..... N75-15133*#

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